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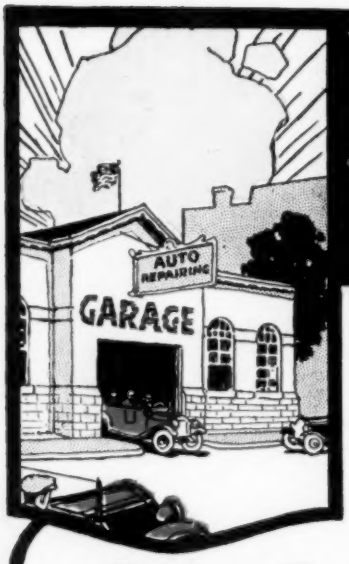

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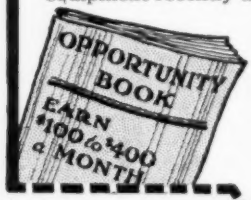

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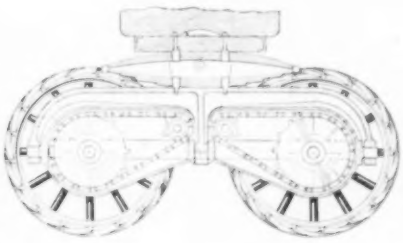
Vol. 32 JULY, 1919 No. 1

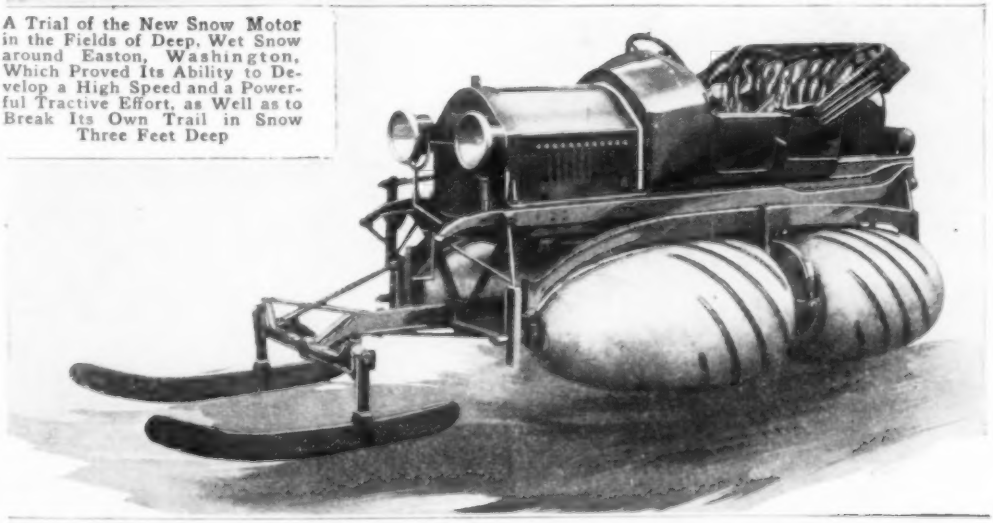
Snow and Ice Auto Has Egg-Shaped Runners

PREPARATIONS are going forward in a western city for the commercial production of an automobile intended to run only on the snow and ice fields of northern latitudes. The traction mechanism consists of four egg-shaped drums mounted in place of the usual wheels, but with their axles longitudinal. The surface of each drum carries a series of helical flanges, like a screw thread of exaggerated pitch, those on opposite sides of the car revolving in opposite directions, driven by chains from the engine shaft. The regular gear shift is used, and ordinary runners on an extension of the frame take the place of the steering wheels. High speed and positive traction are attained by the machine.

A Trial of the New Snow Motor in the Fields of Deep, Wet Snow around Easton, Washington, Which Proved Its Ability to Develop a High Speed and a Powerful Tractive Effort, as Well as to Break Its Own Trail in Snow Three Feet Deep



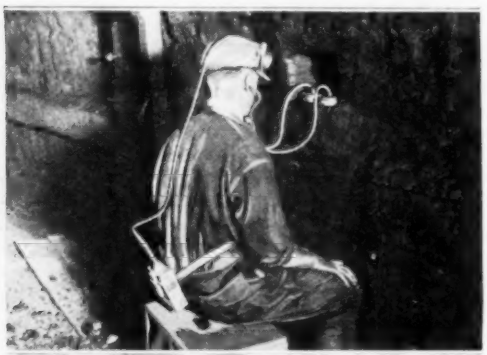
Cross Section through Drums and Driving Gear, Showing Method of Suspension, Chain Drive, and Longitudinal Axles of Spiral-Shod Drums



In This Full View of the Snow Motor the Arrangement of the Runners Which Take the Place of Steering Wheels, and the Extension of the Frame for Their Support are Clearly Shown. The Helical Flanges on the Egg-Shaped Drums are Also Plainly Revealed

TO RESCUE TRAPPED MINERS WITH AID OF WAR DEVICE

In the latter days of the war reports emanated from France of a mysterious listening device which "heard" sounds in-



The "Geophone," Used in a Coal Mine, Enables the Listener to Detect Sounds Originating More Than a Thousand Feet Distant

audible to the ear and located their source. The same mechanism, developed to highly practical form by American engineers, has now been adopted by the U. S. Bureau of Mines for locating miners accidentally entombed. The instrument, called a "geophone," is practically a miniature seismograph. It is quite simple, consisting of an iron ring closed at each side by a diaphragm of mica. In the center is suspended, by a bolt through the diaphragms, a disk of lead. A brass cap forms an air chamber at each end. To the center of one cap is attached a rubber tube with stethoscopic earpieces. The metal case, set on end on the ground, vibrates to every shock; but the lead disk, held by inertia, does not. The resulting disturbance of the mica diaphragms is communicated to the earpieces with extraordinary sensitiveness. With two instruments, one for each ear, the listener can accurately locate the source of the sound, and even identify the cause. In government tests, pounding with a sledge was located through 1,150 ft. of bituminous coal, other concussions registering in proportion.

BOTTLE OF UNBLEACHABLE INK SENT TO PEACE CONFERENCE

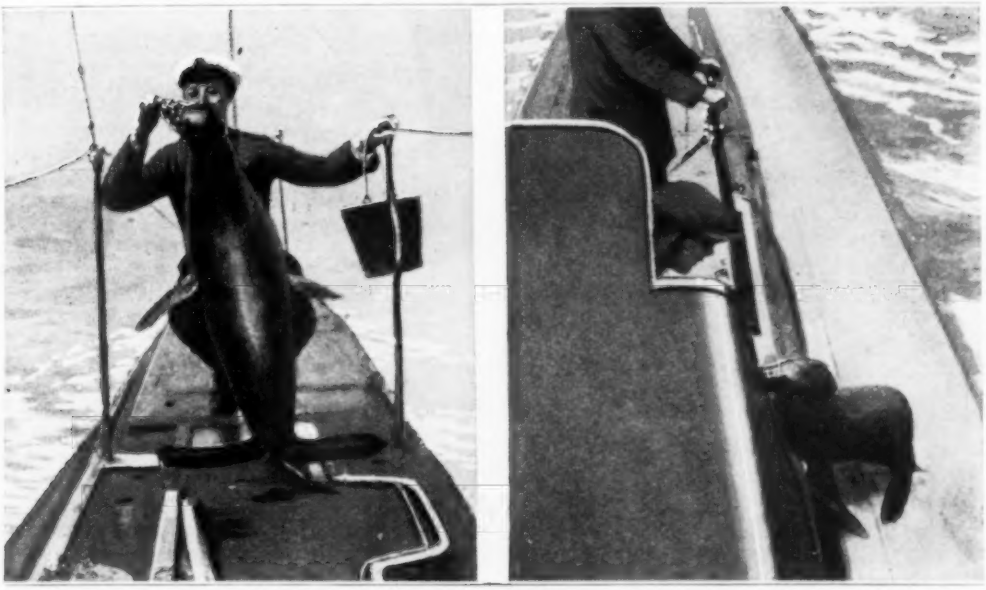
The ink used in writing the American Declaration of Independence is fading so rapidly that the precious document is kept in a darkened room. Frequent experiences of this sort have induced historians to call for an unfading ink with which to record for all time the present world-peace treaty. And in response to the demand, the inventor of a famous shorthand system has dispatched to Washington, D. C., a bottle of an ink which he maintains will remain legible for thousands of years. In fact, the government chemists have declared the ink unbleachable, and the state department is said to have forwarded half a pint of the fluid to President Wilson. The imperishable ink is the result of experiments begun by the inventor's father and continued by the son after his death.

¶ The city of Albany, N. Y., will probably follow Atlantic City, N. J., in the establishment of a permanent airdrome, in consequence of the selection of a local field by the government as one of the 32 official landing places.

SEA LIONS TRACK U-BOATS BY SOUND OF MOTORS

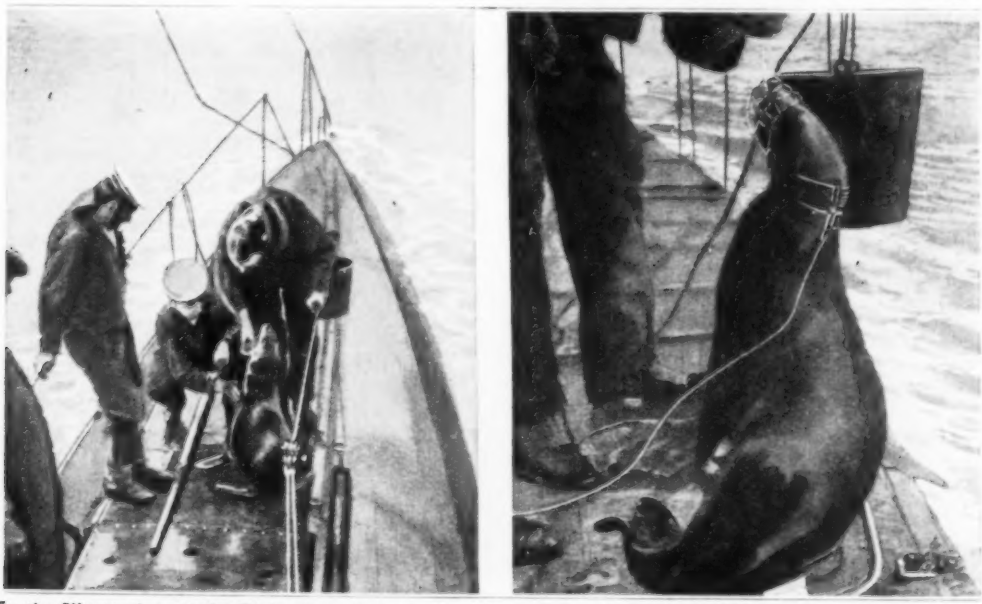
The story of the submarine-chasing sea lions trained by the British navy is as odd as any other developed by the unusual circumstances of the last few years. The two sea lions used, a male and a female, were never credited with any "killings," yet the experiments were certainly remarkable in themselves. The general plan was to teach each animal to track a fleeing U-boat by the sound of the motors in the hope of getting food, dragging with it a conspicuous float that would reveal the position of the prey to the watchers on the surface. A depth bomb or two would do the rest.

With this end in view, the little sub chasers were fitted with muzzles, and collars to which the floats were attached, and their training was begun. They were first carried to a quiet inland lake, where they were taught, after repeated trials, to expect a feed of fish as a reward for swimming to an electric buzzer under the surface. Reaching perfection in this, they were removed to a naval base and made acquainted with their first submarine. The work here was at first much the same as before, the submarine simply lying on the surface and betraying its presence with the buzzer. Next came experiments involving a few turns of the propeller to accustom the animals to the new sensa-



These Sea Lions were Trained to Track U-Boats to Their Doom by Following the Sound of the Submerged Motors. To Their Necks were Attached Small Red Floats Which Enabled the Destroyers to Follow Their Movements. The Sea Lion at the Left is Making Friends with the Commander of the British Submarine Used in the Experiments. To the Right, the Animal is Coming Aboard after a Practice Chase

tion. Then the buzzer was discarded altogether, and the propeller used entirely. And finally the sub actually moved about below the surface, the commander standing to his periscope, however, ready to shut off the power as soon as the animals approached the whirling propellers. These concluding trials were very satisfactory, as the submarine commander often opened his conning-tower hatch to discover his pursuers already on deck, barking loudly for the fat fish they knew were coming.



In the Illustration at the Right One of the Submarine-Hunting Sea Lions is Receiving His Fish through a Trapdoor in His Muzzle, as a Reward for a Successful Practice Chase. The Animals were Muzzled, as It was Found That They would Otherwise Go on Fishing Expeditions of Their Own. In Both of These Photographs may be Seen the Cord Leading to the Float Which Traced Their Movements under Water

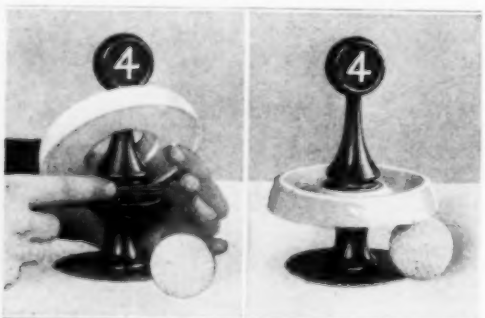
WRESTLER PRACTICES DEADLY HOLD ON WOODEN DUMMY

A well-known wrestler's fondness for the deadly headlock was the cause of so much wear and tear on the head of his training partner that his manager was finally forced to cast about for a mechanical substitute. A wooden head was finally devised that takes the punishment uncomplainingly, and yet strengthens the athlete's arm and shoulder muscles. The head is split lengthwise to permit the introduction of three heavy coil springs.

This Mechanical Training Partner Takes the Punishment When the Heavy-Weight Wrestler Practices His Favorite Head Hold. The Three Springs in the Center Furnish Resistance for the Exercise

INDOOR "HOLE" MAKES ANY CARPET A PUTTING GREEN

Devotees of indoor golf will thank the inventor of another little contrivance which makes the parlor carpet the best substitute known for a putting green. In principle, a heavy disk, just the diameter of the hole, is suspended on a standard at such a height that the golf ball is held firmly as it rolls underneath. Thin washers are provided, with which the disk may be adjusted for different-sized balls.



This Is the Indoor "Hole" Which Helps the Golfer to Polish Up His Putting Form. Pressure from the Heavy Disk Holds the Ball in Position

RUNNING INCANDESCENT LAMPS IN SERIES WITH ARCS

Where incandescent lamps are used in series with arc lamps for street lighting, considerable trouble is caused by surges of current, which burn out the incandescent filaments. In the street circuits of an eastern city two solenoids are arranged with their plungers in vertical line, making and breaking contact between their ends. This regulates resistance in series with the incandescent lamps, preventing damage. With a negative surge, or voltage drop, the upper plunger falls; with a voltage rise, the lower plunger is forced upward. The filaments are thus protected both ways.

MEMORIAL ILLUMINATION TO BE YEARLY EVENT

Crosses of light appeared on many of New York City's tall office buildings last Easter Eve, in commemoration of the allied soldiers and sailors who died for liberty. The great crosses were easily and effectively formed by allowing the lights to burn only in specified rooms, keeping the others on that side of the building either dark or curtained. Such crosses will become an annual feature.

OUTSIDE SOUNDS INAUDIBLE WITH NEW TRANSMITTER

The release of information about the special telephone transmitter used in army and navy airplane work reveals a seeming paradox. The impossibility of using the ordinary transmitter in noisy surroundings arises, as is well known, from the impinging of extraneous sound vibrations on the diaphragm. The inventors of the new noise-excluding transmitter, two California men, in their design took a step whose logic might have been concealed by its very audacity. Stripped to its basic principles, the device is a diaphragm without a case. It shuts out impertinent sound waves by letting them in!

Analyzed, this apparent contradiction becomes sane and reasonable. Vibrations useful to a transmitter must impinge on

The Airplane Form of the New Telephone, Immune to Noise, Appears on the Left as It is Used, While the Inserted View Indicates the Arrangement of Its Parts, the Receivers being Separate. On the Right Is the Commercial Type, with Its Two Receivers and Its Automatic Switch Stand

only one side of its diaphragm. Simultaneous impulses on both sides annul each other, and the diaphragm remains quiet. That is exactly what happens to outside noises with the new transmitter. It has a case, of course, for mechanical reasons, but one so thoroughly perforated as to be practically open. Only the desired voice vibrations, striking all on one side, retain full potency. The complete instrument includes two receivers, one for each ear.

In military work, British and French as well as American, it has been used alongside of Liberty motors running full tilt, with no trouble whatever.

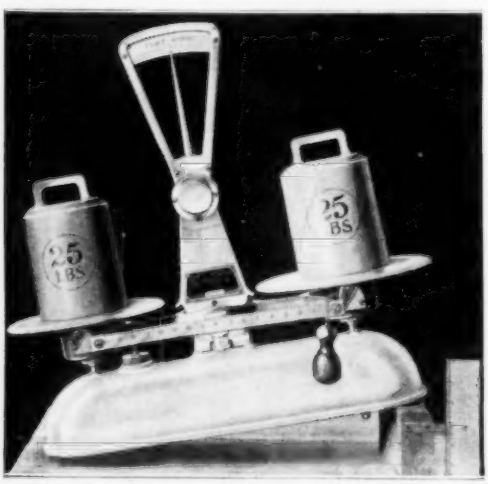
This Illustration Shows That the Commercial Instrument Is No More Difficult to Use Than the More Familiar Form of Desk Telephone

Army and Navy Air Services Used Thousands of the Noise-Proof Telephones during the War, and This Picture Shows How They were Tested in the California Factory

The Storage Battery Which Drives This Exceptionally Compact Mining Locomotive is Located under the Flat Top Plate. The Machine is Seen in Side View at the Right, While Its Applicability to Low-Ceiled Tunnels is Indicated Above

BALANCE SCALE IS ACCURATE WHETHER LEVEL OR NOT

Since balance scales depend upon gravity for their action, it is ordinarily essential to accuracy that they rest perfectly level. This necessitates not infrequent adjustment, as all surfaces deviate more or less from the horizontal from time to time. An Ohio concern has brought out a scale whose indicator level and dial retain their positive relation to the balance even when the base is tilted as much as 30° out of the horizontal, weighing accuracy being unimpaired by this unusual position. Balancing against standard



This Scale Weighs Just as Accurately in This Position as It Does When the Base Is Level. The Indicator Centers for Exact Weight, or Oscillates to Show Over or Underweight

weights, the large and conspicuous indicator centers for exact weight, and oscillates over side graduations to show over or underweight up to two ounces.

STORAGE-BATTERY LOCOMOTIVE DESIGNED FOR MINING USE

A powerful locomotive only 32 in. high, driven by a storage battery, has been designed by a St. Louis inventor. Its compact form makes it especially suitable for work in coal mines. The body is mounted on a four-wheel truck which it overhangs at both ends, the driver sitting sideways in the front extension. The storage battery, carried in the center of the body, is accessible yet well protected. Its capacity is sufficient for a full day's work on a single charge. With its 7½-hp. motor, the little locomotive hauls cars loaded to a total weight of 100 tons.

WOULD TEACH AMBIDEXTERITY IN FRENCH SCHOOLS

Among many lessons France has learned from the war is one that should long ago have been obvious to the world. The necessity of teaching men injured in the right hand to use the left, and vice versa, has revealed the value of ambidexterity. Practically the entire human race is handicapped by training which makes one hand merely an unskilled assistant to the other. A surgeon has urged the French Academy of Medicine to pursue active means, through public schools and appeals to mothers, to establish instruction in the equal use of both hands as a national custom.

¶With the expected release by France of 30 Brazilian ships, it is believed that little difficulty will be experienced in inaugurating the proposed steamship service between Rio de Janeiro and San Francisco.

CRIPPLED TOURIST HAS PERAMBULATING HOTEL

By JOHN EDWIN HOGG

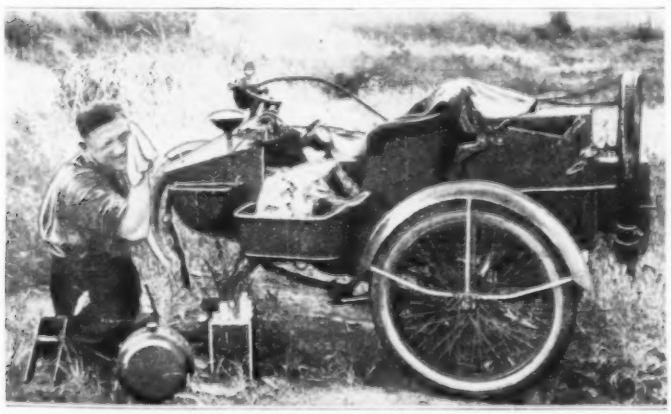
A new motorcycle and sidecar outfit is a perambulating hotel in which all the conveniences of a home have been incorporated. It was built to the order of Alfred Leroy, a Los Angeles cripple, who has made three round trips across the American continent with similar vehicles.

The most novel part of the outfit is Mr. Leroy's sleeping arrangements for long cross-country tours. Taking advantage of his "abbreviated" condition, he has arranged a berth in the body of the sidecar. This consists of an air mattress, air pillow, and bedding, which, when not in use, rolls up and out of the way in the nose of the sidecar body. This rolled bedding is firmly held in place by the seat of the vehicle, which is removed when the berth is made up. Over the whole there is a canopy of rubberized material which excludes rain and dew.

The Crippled Driver of This Outfit Finds a Comfortable Berth at Night in the Sidecar. The Bedding is Stored under the Seat in Daytime

A 2-gal. canteen in a metal container on the side of his machine serves the combined purpose of a carrier and an ever-handy washbasin. There is a drain hole in the bottom, and when the canteen is removed a stopper is placed in the hole, and the water from the canteen is poured into the receptacle. After the completion of toilet operations, removal of the cork permits the water to run out on the ground. In the trunk on the rear of the outfit is carried a set of cooking utensils and a few provisions.

These combinations render Mr. Leroy wholly independent of hotels or towns for a week at a time, if his fancy so dictates, and he and his dog are able to travel for days, caring little or nothing for schedules or objectives.



A Drain Hole and Stopper Convert the Canteen Receptacle at the Side of the Machine into a Washbasin, Whenever One is Needed, the Canteen Having Two-Gallon Capacity

ENGINE, DYNAMO, AND MOTOR IN GERMAN TRAIN DRIVE

Passenger cars, designed for the railroads of Prussia and Saxony, Germany, have seating compartments at each end, and in the center a cabin containing a 200-hp. Diesel motor coupled to an eight-pole, 140-kw. generator. A separate 7½-kw. generator excites the fields and charges a 35-cell, 95-ampere-hour storage battery. The traction motors develop 160 hp. continuously, but are capable, as is the generator, of carrying a heavy overload temporarily. The car without load weighs 64 tons, carries fuel for 375 miles, and can maintain a speed of 44 miles an hour on a level and negotiate heavy grades. It accommodates 80 passengers.

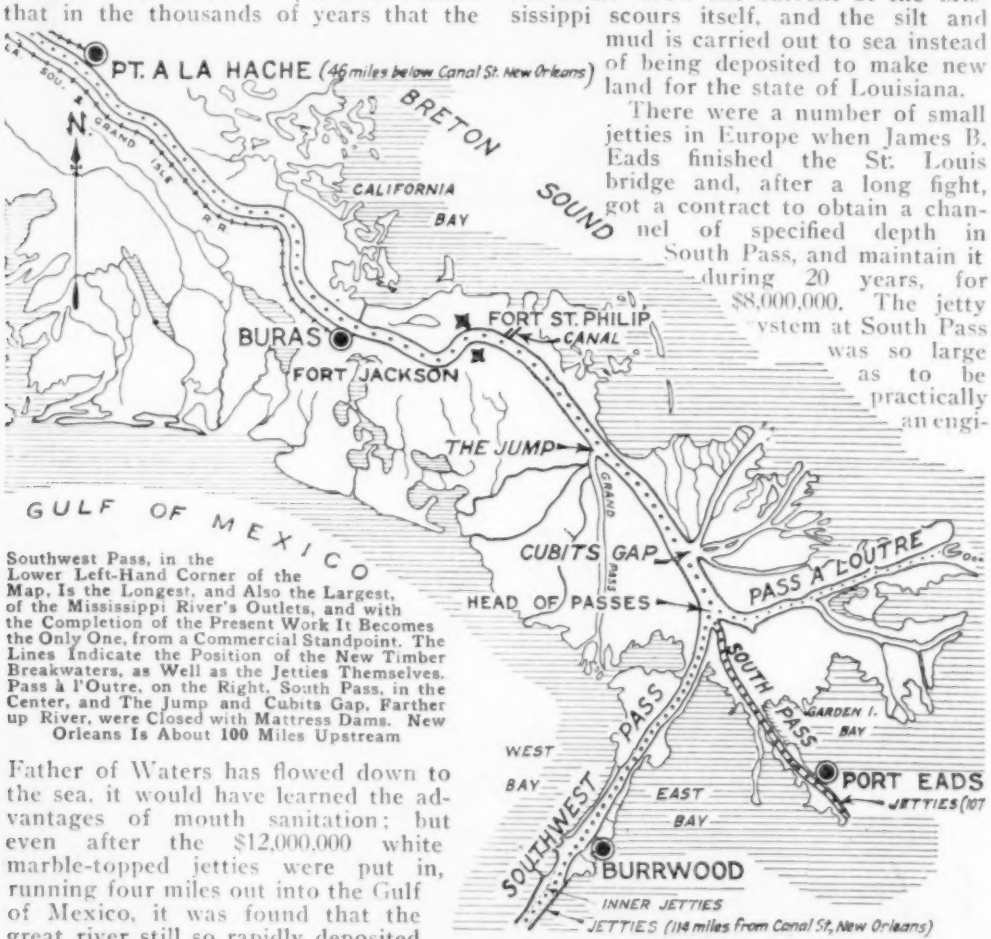
TEACHING THE MISSISSIPPI TO BRUSH ITS OWN TEETH

By H. H. DUNN

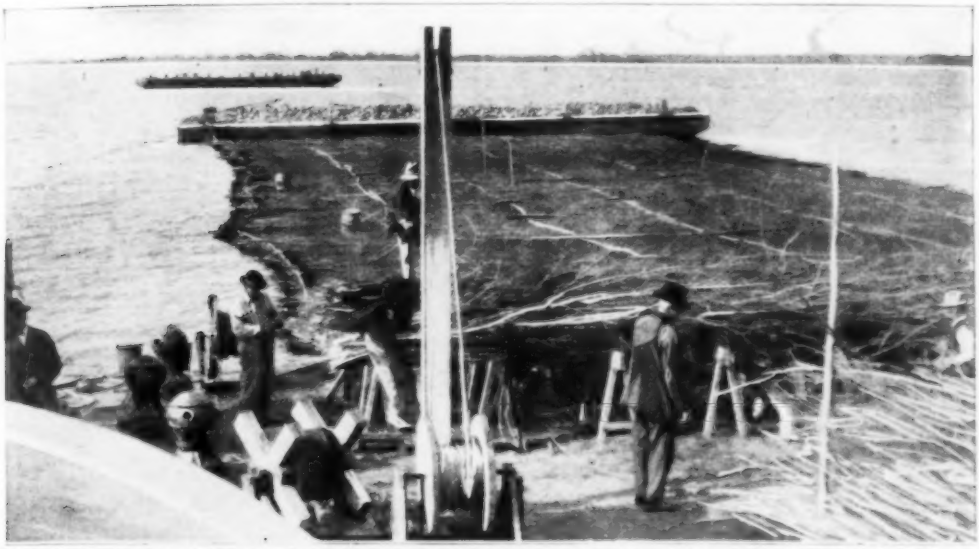
BEGINNING the middle of this summer, the Mississippi River will be able to brush its own teeth and keep its own mouth clean of mud and silt and sand, which for so many generations have kept government dredges and other boats busy down at Port Eads holding open that mouth so that ships might pass in and out, and 100 miles up the river to New Orleans. One would think that in the thousands of years that the Father of Waters has flowed down to the sea, it would have learned the advantages of mouth sanitation; but even after the $12,000,000 white marble-topped jetties were put in, running four miles out into the Gulf of Mexico, it was found that the great river still so rapidly deposited earth from Minnesota and Wisconsin and Iowa and Arkansas and other states, that it required millions more to let shipping through the passes. So it was not until this year of 1919 that a means was devised to make the old river clean its own channel.

The method was very simple—after they found out how to do it—for it consisted merely in narrowing the channel inside the jetties, by means of timber breakwaters, to 1,000 ft., with a mean depth of 35 ft., and then directing the main current of the Mississippi through this narrowed channel. Only one dredge will be required now for soundings and records, whereas three or four dredges were employed before to keep the channel clear. Now the current of the Mississippi scours itself, and the silt and mud is carried out to sea instead of being deposited to make new land for the state of Louisiana.

There were a number of small jetties in Europe when James B. Eads finished the St. Louis bridge and, after a long fight, got a contract to obtain a channel of specified depth in South Pass, and maintain it during 20 years, for $8,000,000. The jetty system at South Pass was so large as to be practically an engineering innovation. Southwest Pass was abandoned when Eads finished at South Pass, about 40 years ago. But in 1903, seeing that the average depth of ships was increasing and that the tendency was decidedly toward deep draft, the government began a jetty system for Southwest Pass, much larger than the Eads jetties. It is being used now; but



Southwest Pass, in the Lower Left-Hand Corner of the Map, Is the Longest, and Also the Largest, of the Mississippi River's Outlets, and with the Completion of the Present Work It Becomes the Only One, from a Commercial Standpoint. The Lines Indicate the Position of the New Timber Breakwaters, as Well as the Jetties Themselves. Pass à l'Outre, on the Right, South Pass, in the Center, and The Jump and Cubits Gap, Farther up River, were Closed with Mattress Dams. New Orleans Is About 100 Miles Upstream



This Shows the Way in Which the Willow Mattresses are Constructed, of Trees Bound Together with Iron Bands and Steel Rope. The Scow in the Middle Distance is Dropping Stone on the Mattress as It is Rolled off the Weaving Scow in the Foreground. The Willow Trees are Cut along the Banks of the River, and Since Green Willow Keeps Virtually Forever in Fresh Water, the Mattresses Are Practically Imperishable

when the construction innovations are completed, more than 99 per cent of the world's ships will be able to come safely and swiftly into New Orleans in unfavorable conditions of wind and tide and river level, and all but eight of the Atlantic liners will be able to do so when the conditions are favorable.

The jetties, running from the mouth of Southwest Pass into the gulf, are 6,000 ft. apart at their head and 3,600 ft. apart at sea line. The Mississippi has three main mouths, with two other minor mouths. Southwest Pass takes 50 per cent of the traffic; South Pass handles 14 per cent, and Pass à l'Outre takes care of the balance. To make Southwest Pass self-cleaning, the other passes were closed with sunken dams, on mattresses of willow trees, bound together with wire, in 200-ft. sections, and weighted with stone, so that the main force of the current was directed into Southwest Pass. Then the wooden bulkheads were built, 1,000 ft. apart, and the great stream turned into this channel, about one-fifth as wide as the old channel between the jetties, yet wide enough to handle all the traffic. Two hundred men have been employed for nearly three years on this work and they have driven approximately 10 miles of sheet-piling bulkhead, employing 13 cargo barges, three tugs, three floating derricks, and two floating pile drivers on the job.

The cut-off dams which have been put in at The Jump and at Cubits Gap, the other two mouths of the Mississippi, as well as at Pass à l'Outre, consist of willow mattresses, weighted down with rock from the Gantt marble quarries in Alabama, brought on barges down the Black Warrior River, through Mobile Bay, Mississippi Sound, Lake Borgne,

The "Jumping-Off Place" of Southwest Pass, the End of the Jetty System Out in the Gulf of Mexico: The Visible Portion, Surmounting the Substructure of Mattress and Piling, Consists Mostly of Fragments of Marble from the Quarries on the Black Warrior River in Alabama

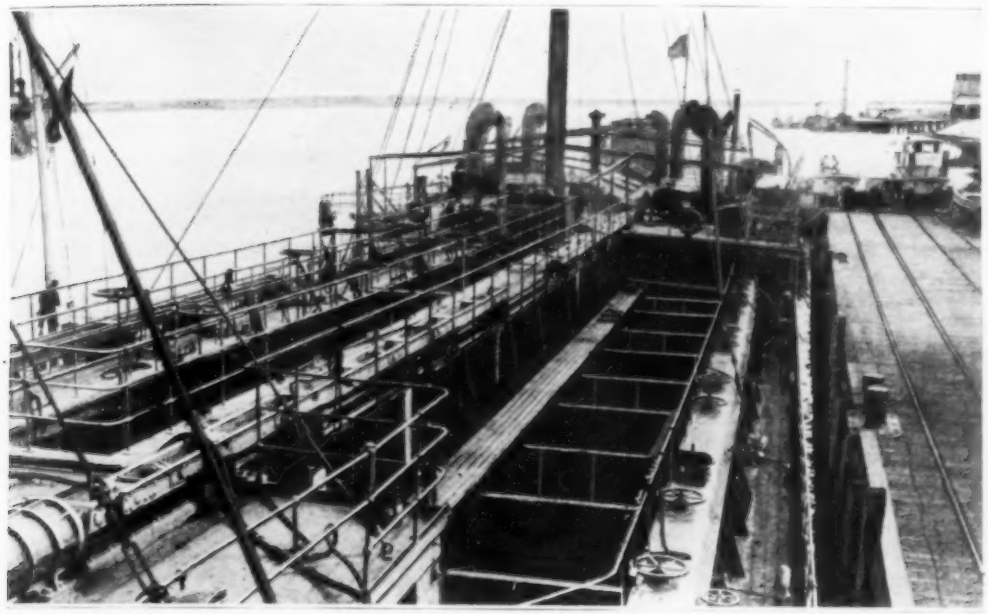
and Lake Borgne Canal into the Mississippi, and thence down that stream to its mouth. One hundred and twenty feet deep at New Orleans, the river has so filled itself with mud that when these inner bulkheads were started, the natural average depth through the passes was only nine feet, and they were kept open to traffic only by the strenuous efforts of a fleet of government dredge boats. Now the river is keeping itself open, through the greater flow of water forced through South and Southwest passes.

One of the Completed Sections of Breakwater inside the Jetty on the Right-Hand Side of Southwest Pass: The Method of Construction with Sheet Piling, Heavy Timber Walings Bolted to the Piling, and Stout Angle Braces, is Clearly Shown. The Dark Line in the Distance Is the Opposite Breakwater

The willow mattresses on which these cut-off dams rest are interesting. Mattresses are woven on barges anchored where they are to be laid, and as it is rolled off the barge, another barge, coming behind, drops onto it tons of stone in blocks of 100 to 150 lb. each. The willow for these mattresses is cut along the banks of the river, and is used because green willow keeps virtually forever when immersed in fresh water. Rolls of these green willow trees are laid side by side on bands of steel wire, one-quarter inch in diameter, each roll being bound together itself with band iron. Then a woof of heavy steel wire is run through and the mattress slipped off the barge until the desired length is reached. These mattresses are made in sections, usually 200 ft. wide, but ranging in width, when complete, from 500 up to 2,000 feet.

As soon as a section is laid and covered with stone, the weaving barge passes back over it, dropping another section of mattress, while the stone barge follows, laying another layer of stone,

Fragments of Marble Brought from the Alabama Quarries by Barge: This Is Part of the Material Used as Ballast to Give Solidity to the Timber Breakwaters along the Inner Channel of Southwest Pass, and Also for Weighting Down the Willow Mattresses of the Cut-Off Dams



That the United States Dredge "New Orleans" Is a Craft of No Mean Proportions is Revealed by This Picture. The Vessel Is of the Hopper Type, Its Large Capacity Being Apparent from the View of the Open Hoppers along the Near Side. They are Emptied, of Course, through the Bottom When the Dumping Ground is Reached. Some of These Mississippi River Dredges Are Quite Large, Having a Capacity of Over 1,000 Cubic Yards an Hour

this operation being repeated until the desired height is reached. Usually this is about three feet below the surface of the stream, so that the river will find relief in periods of high water and not send down such a flood as to tear out the wooden breakwaters which guide the stream into the gulf. On top of the uppermost layer of mattress is laid a final cap layer of five-ton blocks of marble from the Alabama quarries, and of stone taken from wrecked buildings in New Orleans. Notable among the latter are the stone, and some of the huge stone figures, from the old Cotton Exchange building, which has been torn down to be rebuilt in exact duplicate of its original appearance, but with better inside accommodations.

The "Business End" of the United States Dredge "New Orleans," Showing Part of the Dredging Equipment

Spur dikes are scattered all up and down the passes, to catch silt and earth along the main jetties, so as to build up more artificial land, and forcing the main current still farther out between the wooden bulkheads. The first improvement of Southwest Pass was made in 1836, and it is estimated that in 50 years the river will have deposited so much silt that all the space between the original marble-topped jetties and the wooden bulkheads will have become solid, arable land. This means the rescue from the river of two strips of land each five miles long and 2,000 ft., or more, wide; a considerable area of the best soil in the world, probably worth to the state of Louisiana nearly as much as the financial outlay on the improvement of Southwest Pass, and capable of being converted into a summer resort, five miles out in the

The Extensive Preparations for an Increased Commerce through the Mouth of the Mississippi All Comprise Government Work, and This Group of Temporary Structures Is a Section of the Government Camp on the River, at the Head of the Passes

gulf, free of mosquitoes and other insect pests that infest the inland watercourses.

Launch Used by the Squad of Engineers Whose Task It Is to Take Soundings in the Channel and Measure the Velocity of the Current

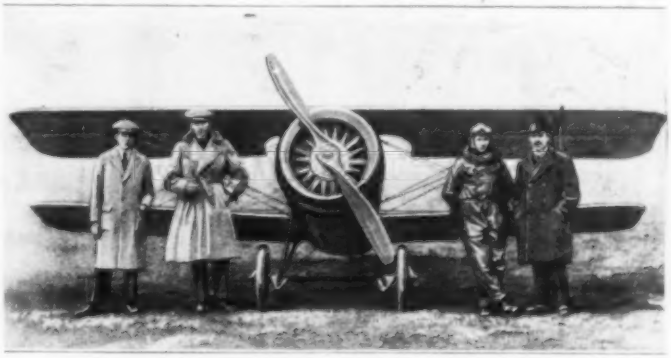
These wooden bulkheads are heavy structures of creosoted timbers, 14 by 14 in., each from 40 to 60 ft. long. The sides toward the channel are of special sheet piling, a sort of interlocking, continuous water fence; solid below the mean water line, and cut open above at alternate timbers to allow the water to pass through freely, and, by this means, to relieve them of the strain of the smashing waves which come rolling in off the gulf. Inside the sheet piling, one six feet above, and the other midway between mean low and mean high-water levels, are longitudinal connecting timbers, walings bolted firmly to the heavy piles. Inside this whole fence is a supporting row of piles, driven at an angle, still further to strengthen the bulkhead against the waves. The combined length of these bulkheads is 52,250 ft., or in the neighborhood of 10 miles.

The work maintains the very existence of New Orleans, and permits the continuance of the whole water-borne commerce of the Mississippi Valley. More than that, it opens practically a new gateway for big ships to the upper waters of the river, where other plans are being developed for the purpose of preparing and maintaining an adequate path for increasing trade possibilities.

Close View of the Finished Jetty, with Its "Marble Top" Consisting of Thousands of Tons of Rock Fragments, All Brought at Least a Hundred Miles by Barge

MAKERS EXPECT DEMAND FOR SMALL SPORTING AIRPLANE

In their efforts to continue production on something like war-time scale, the manufacturers of airplanes seem to incline to the construction of two distinct types, the huge multimotored plane for commercial purposes, and the small ship for sporting use. Perhaps they place most faith in the latter, with its easy operation and small storage space required, as the best stimulant to a popular demand. At any rate, many small models have appeared on the commercial market, among them the Graham White Bantam single-seater shown in the illustration, driven by an 80-hp. rotary motor at more than 100 miles an hour. The little "bus" is only 16 ft. 9 in. long. The tanks carry gasoline and oil sufficient for a three hours' flight.



This Fast Little Single-Seater may be Housed in a Small Space, as It Has a Span of Only 20 Feet and a Length of 16 Feet 9 Inches. The Upper Plane Lies Level with the Pilot's Eyes

PROJECTED TEN-MILE RAILWAY OPENS VAST TIMBER TRACT

A railroad extension only 10 miles long, promised for completion this summer, has aroused in the city of Chehalis, Wash., anticipation as keen as might a transcontinental trunk line. The reason is that the new spur will tap a belt of virgin timber estimated to contain not less than 20,000,000,000 ft. of fir and cedar. The construction will begin at the terminus of an existing line 19 or 20 miles long, so that the completed road will run about 30 miles southeast of Chehalis, toward Mount St. Helens. Cowlitz and Green rivers, and several creeks, are the waterways whose lumbering facilities will become tributary to the new road, and help distribute work and prosperity along its short path.

¶When the fighting was at its height, the Signal Corps of the United States Army was using, among other things, approximately 68,000 miles of outpost wire a month.

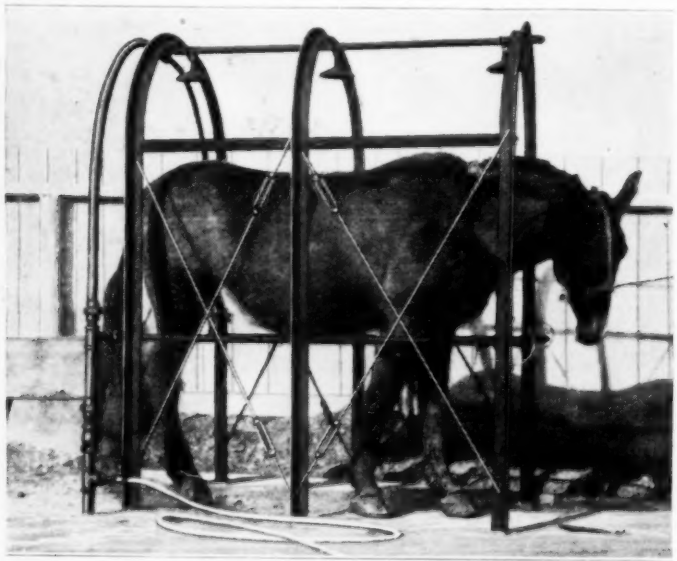
SALVATION ARMY FLOAT RECALLS WAR SERVICE

"Java and sinkers" from the hands of a smiling Salvation Army lassie filled with gratitude the heart of many a battle-worn doughboy not many months ago. He will certainly never forget his appreciation of the kindly service nor his relish for the home-cooked dainties. This immortal combination was recently made the decorative feature of an artistic float that formed part of a large parade.

Nobody Applauded This Float More Than the Boys Returned from France, Who had Eaten the Salvation Army's Peerless Pies and Doughnuts, Right under "Jerry's" Nose, Only a Few Months Before

MULES ENJOY REFRESHING SHOWER BATH

One mine owner gives each of his mules a thorough shower bath after the work underground has been completed. The mules are said to take keen pleasure in this humanitarian treatment, which not only keeps their coats clean and healthy, but even makes them more fit for work on the following day. The shower bath has three sprays.



On being Released from Duty in the Mine the Mules Run to This Shower Bath of Their Own Accord. The Treatment Keeps Them Clean and Fit for the Work of the Following Day

RAINBOW COLORS OF INSECTS EXPLAINED BY SCIENCE

The phenomena of insect coloring which sometimes make the lowly beetle, seen in the sunlight, a thing of iridescent beauty have been studied and divided into three classes. Among the first are the insects which owe their color to chemical causes, like the caterpillar whose body is tinged by the greenish substance, chlorophyll by name, contained in the leaves it feeds upon. On the other hand, the color in the wings of a dragon fly is largely caused by the varying thickness of the membranes, which act as prisms, diffracting the white light into its prismatic colors. But in the third class, embracing those colored by both chemical and physical causes, are found the most interesting specimens. Thus the beetle from Costa Rica, which seems to be made of tin, and the beetle from Australia, which would pass anywhere for pure gold, both look as they do because they wear a coat which not only contains a coloring pigment, but is also overlaid by a polished refractive surface.

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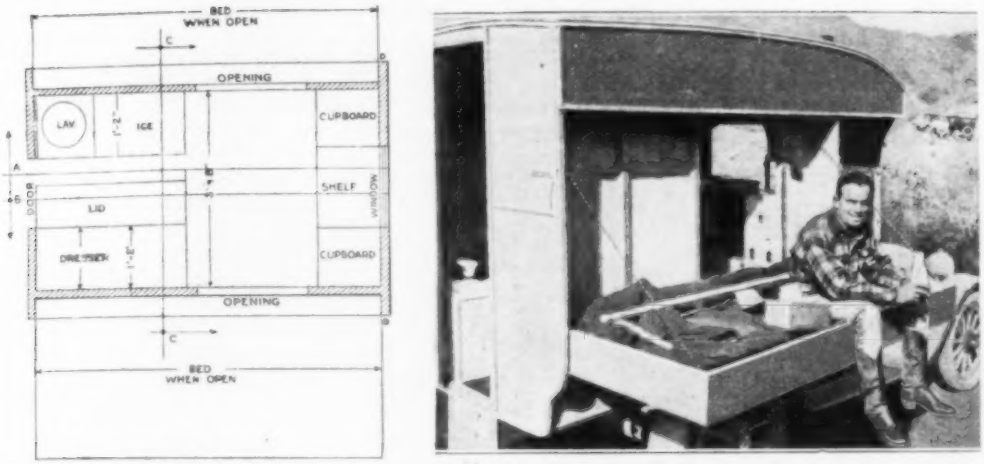
This Collapsible Army Pile Driver is Mounted on Wheels for Quick Transportation to the Scene of Action. Power is Supplied by a Small Gasoline Engine

SMALL MILITARY PILE DRIVER ADAPTED FOR OPEN WARFARE

As wars are fought nowadays, the pile driver's contribution to victory may often be as essential as that of the big guns. The machine in the illustration is of the type recently designed for military use, chiefly in open warfare, where its mobility and ease of operation should make it a valuable and essential piece of engineering equipment.

¶ In recent Signal Corps experiments, 11 telephone and eight telegraph messages were sent simultaneously over a single wire. One telephone current traversed the wire, the other 10 consisting of radio waves confined and guided by it. The telegraph was multiplexed, four messages in each direction.



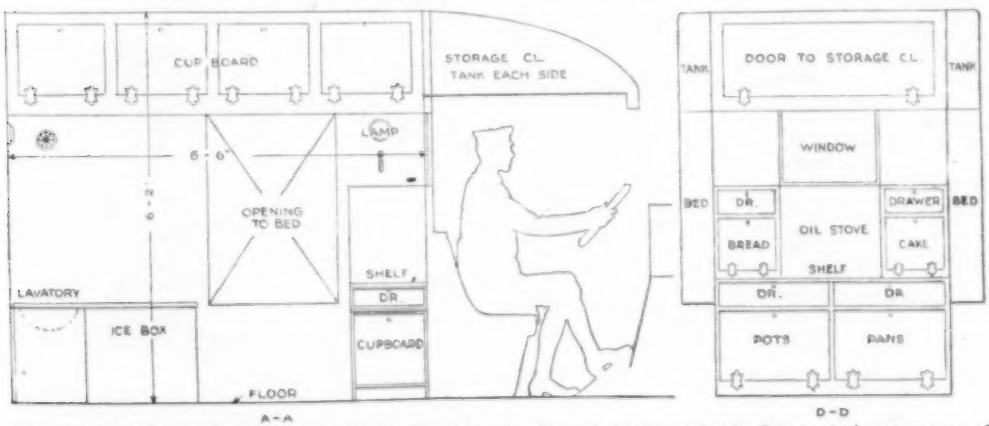
Plan View of Body Back of Driver's Seat, at the Left, Indicates Location of Lavatory, Ice Box, Dresser, Cupboards, and Beds, While the Right View Shows One Bed Opened, with a Certain Well-Known Movie Player Sitting upon It. Through the Opening at His Back Is a Glimpse of the Stove

BEDS, LAVATORY, AND KITCHEN IN SMALL AUTO

That it is possible to include within the narrow confines of one of the smallest of autos such home comforts as beds, library, lavatory with hot water and shower, and 15 days' supply of food, has been demonstrated by the camp-loving brother of a noted motion-picture comedian. To accomplish this purpose, every inch of space in body and top has been utilized. The two beds open like bunks from the sides of the body. In front is a kitchen, with oil stove and pantry, including bread and cake boxes and cupboards for pots and pans. Lavatory and ice box are at one side, a dresser occupying the corresponding space at the other side. The fixed top is full of cupboards, and even the peek just above the driver's head contains a large storage closet and a tank at each side.

BLIND MAN INVENTS DIRECTION INDICATOR

When a Seattle young man of 26 met with an accident in 1916 which resulted in the loss of his eyesight, he immediately set to work to try to evolve a mechanical device which would be, as near as possible, a substitute for eyes. After almost two years of patient effort, he has perfected an instrument which enables him to get about without the use of a cane,



Side and Front Elevations, Left and Right, Respectively, Reveal the Remarkably Compact Arrangement of Necessities and Conveniences in the Small Body of the Car. The Multiplicity of Storage Cupboards and Drawers Is Especially Noteworthy

and the device has possibilities for use in navigation on land, on the sea, or in the air.

The inventor calls his mechanical "eye" a direction indicator. The device is worn attached to his belt and it literally keeps

The Apparatus Hung on the Blind Man's Belt Enables Him to Travel in a Given Direction. A Compass Needle Rings a Right or Left-Hand Buzzer When He Deviates from His Course

him on the "straight and narrow path." The direction indicator comprises a specially constructed compass, two buzzers, right and left, and two dry-cell batteries, and is attached to the belt by clips. The compass has an adjustable cap, which is turned as desired. A notch indicates "north." Two pins are suspended from the cap or cover, and these are dropped over the needle of the compass when it is set. If the wearer deviates from his set course, the compass needle comes in contact with the pin on the opposite side, closing a circuit, and the buzzer on that side sounds a warning.

The compass can be set for any direction and can be changed when desired. It should prove invaluable to the timber cruiser or surveyor, or to the traveler on the desert. It is difficult for men traveling in heavy timber or on the desert to maintain a set direction. But the wearer of the direction indicator would determine his course before starting out, and the buzzers would warn him every time he deviated from that course.

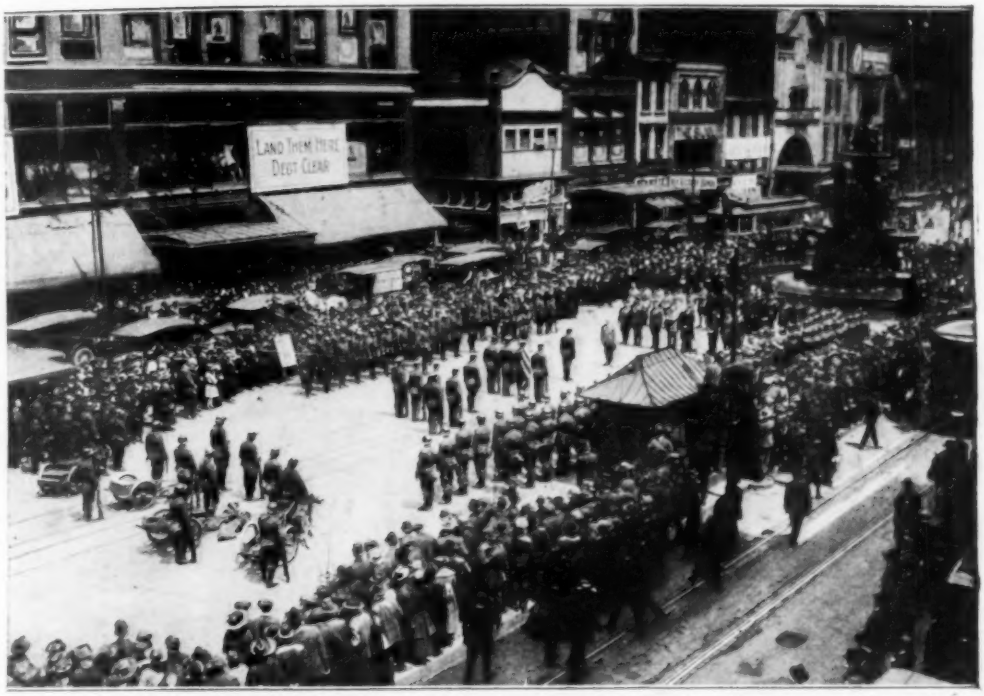
Plans to incorporate the device in boats and air craft, as a means of automatically controlling their direction, are being developed. Instead of sounding an alarm when the craft veered from its course, the indicator would close a contact which would throw over a rudder. The inventor believes that a positive guide for automatically controlled torpedo or bombing craft would thus be afforded.

RAILROAD ADMINISTRATION TO SELL SUMMER TICKETS

The Railroad Administration has authorized the publication, on the Pacific coast, of low round-trip summer-tourist fares to practically all the resorts in the far-western states to which it has been customary to sell summer tickets in the past. Reduced-rate tickets good for three months from date of sale may be purchased from May 30 to September 30, inclusive, presumably with October 31 as a time limit. At a greater reduction, fifteen-day tickets will be sold on Fridays and Saturdays between those dates, to points within a radius of 400 miles.

ROLLING FILES GRIND VALVE IN NEW ENGINE TOOL

A new and ingenious tool for grinding engine valves consists essentially of a series of 18 tiny round files with very fine teeth. These are radially mounted, free to revolve in a small ring, forming a conical group. This ring is inserted in the valve seat. The valve is then centered in the ring, and revolved several times by means of a long, twisted spindle, upon which a grooved sleeve is moved up and down, with light pressure. The surfaces are polished by rotating the spindle between the palms of the hands. The whole operation is completed in three or four minutes.



The French Consul at Cincinnati Decorating an American Captain of That City for Bravery in Battle, in the Presence of French, Belgian, and American Troops

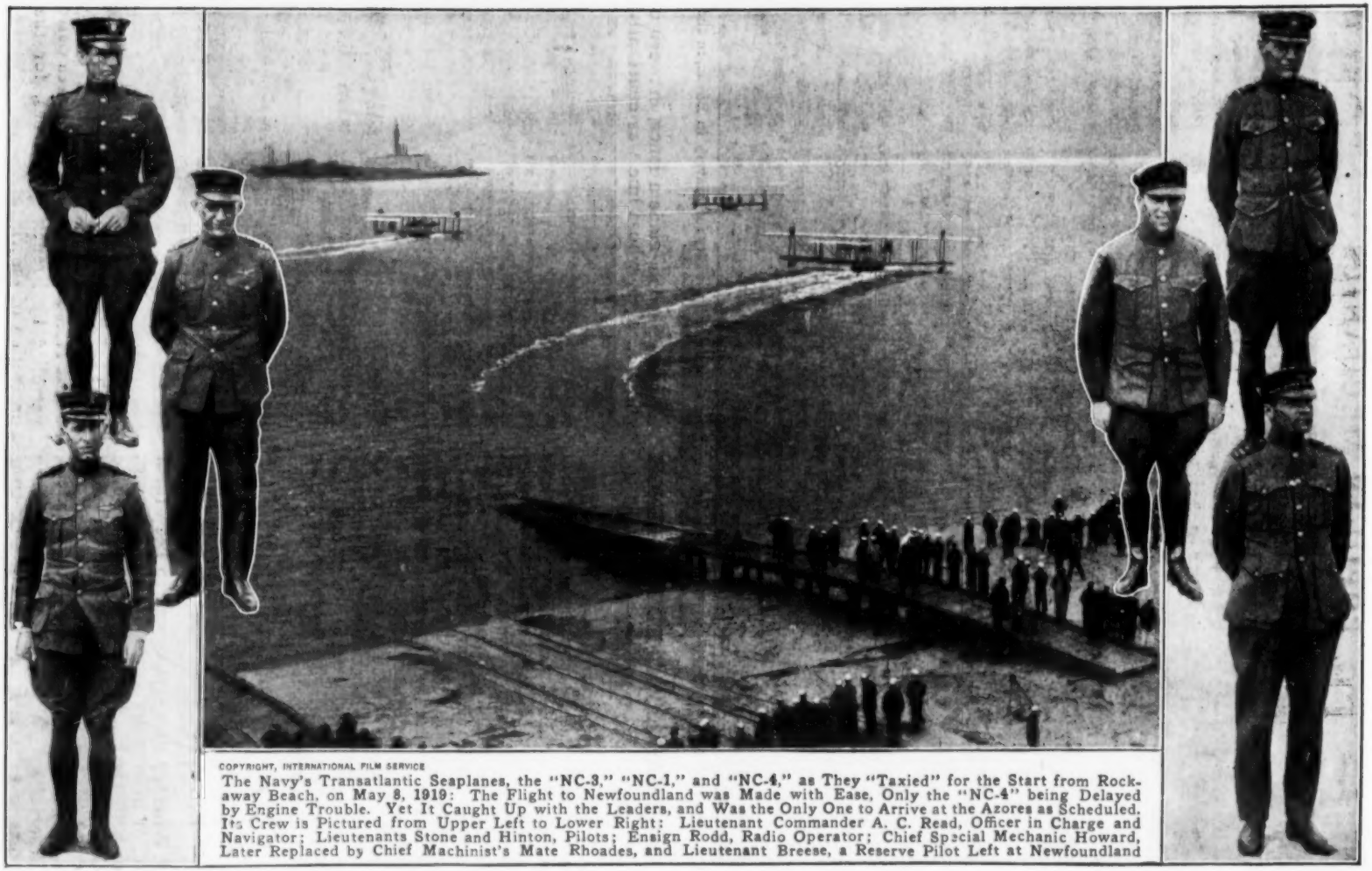
AMERICAN HONORED BY FRENCH CONSUL IN CITY STREET

A busy down-town street in Cincinnati was recently the scene of an occurrence which symbolized strikingly America's present unprecedented relationship with two great foreign powers. Stopping all traffic and pressing back the crowd, the police made way for detachments of French, Belgian, and American soldiers. A hollow square was formed, into which stepped an American captain, late of the A. E. F., accompanied by the local French consul and a number of civic dignitaries. With the usual simple ceremony, the Frenchman pinned the croix de guerre on the American's breast.

GERMAN PEACE DELEGATION KEPT IN FRENCH CORRAL

Whether its purpose was to keep them in, or to keep an unfriendly populace out, or both, the German delegates to the peace conference at Versailles, France, were confined in a barred inclosure which surrounded their headquarters, Hôtel des Reservoirs. Wires, stretched between posts and carrying two tiers of pickets of sharpened wood, made a fence, between 6 and 7 ft. high, whose line was constantly patrolled by French gendarmes, for the protection of the visitors.

Picket Fence Built around the Hôtel des Reservoirs, Versailles, France, to Protect—and Confine—the German Peace Delegates; and a Gendarme on Guard



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The Navy's Transatlantic Seaplanes, the "NC-3," "NC-1," and "NC-4," as They "Taxied" for the Start from Rockaway Beach, on May 8, 1919: The Flight to Newfoundland was Made with Ease, Only the "NC-4" being Delayed by Engine Trouble. Yet It Caught Up with the Leaders, and Was the Only One to Arrive at the Azores as Scheduled. Its Crew is Pictured from Upper Left to Lower Right: Lieutenant Commander A. C. Read, Officer in Charge and Navigator; Lieutenants Stone and Hinton, Pilots; Ensign Rodd, Radio Operator; Chief Special Mechanic Howard, Later Replaced by Chief Machinist's Mate Rhoades, and Lieutenant Breese, a Reserve Pilot Left at Newfoundland

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THE TRANSATLANTIC FLIGHT

Daring Failures and Brilliant Successes Blaze Aviation's Way across the Ocean

By PAUL A. JENKINS

THE whole world heeded the call of red-blooded romance in the month of May, 1919. While thousands watched the bulletin boards and scanned the headlines in Europe and America, while preparations for similar attempts could be heard on both sides of the Atlantic, fifteen square-shouldered young officers of the United States Navy raced above the clouds, through fog and rain, for the Azores; a gallant young Englishman and his companion accepted the challenge and flew from Newfoundland into the darkness, as two others crashed in an attempt to follow.

The United States Navy began to study the possibilities of transatlantic flight in 1917. Busy as the officials were with the perplexing difficulties of sending hundreds of sub-chasers, destroyers, and battleships to the fighting overseas, they realized that some day would come a similar call for ships of the air. So, even in the midst of war, the experts drew apart and commenced their scientific study of suitable airplane design, and of the uncharted winds that sweep the upper air.

Of immediate importance was the problem of designing strong, powerful planes which would leave the coast of America with the certainty of reaching the other side. After collaboration with the engineers of a famous airplane-producing corporation, a design was accepted, and on May 3, 1919, after test performances which astonished airmen both at home and abroad, three of the great planes which were to make the attempt together were commissioned as regular seagoing ships of the United States Navy, at Rockaway Beach Naval Air Station, Long Island.

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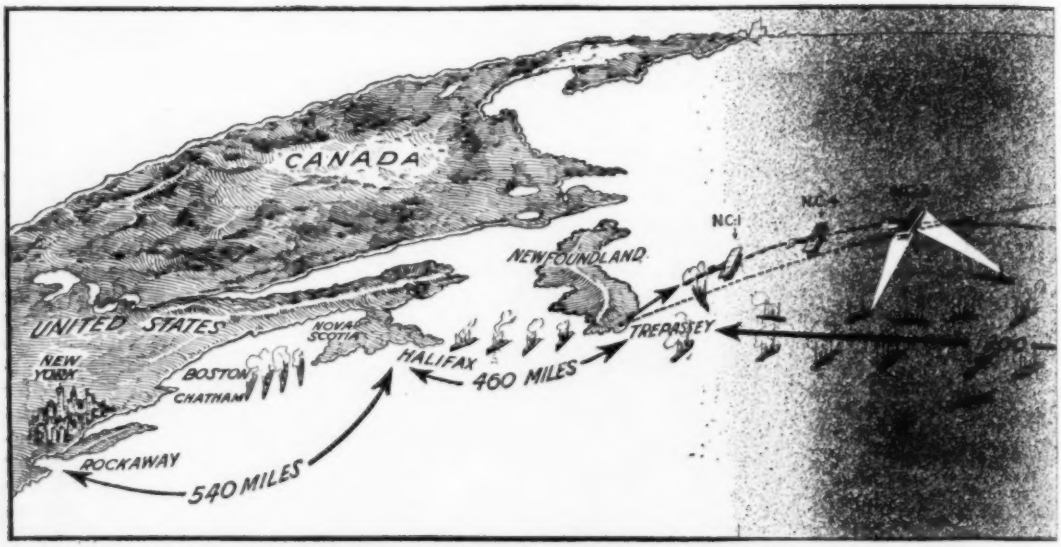
HARRY G. HAWKER

The Fearless Pilot of the Sopwith Transatlantic Biplane was Lured Years Ago from His Automobile Business in Australia to the Infant Airplane Industry in England. He Crowded Much into the Period of His Aerial Experience. In 1912 He Flew a Primitive Biplane Continuously for Eight Hours and 23 Minutes. In 1916 He Set a British Altitude Record of 24,400 Feet

As commissioned, the "NC-1," "NC-3," and "NC-4" are essentially a combination of a stanch, seaworthy hull, with a biplane of large size and sturdy construction. Each hull is 44 ft. 9 in. long and consists of an oak and spruce frame covered by a planking of spruce or cedar. In this hull are places for five men: a navigator with his charts and various observation instruments, in the extreme bow; back of him the two pilots, each with a complete set of controls; back of them nine aluminum gasoline tanks holding 200 gal. each, and toward the stern the wireless operator and engineer with their equipment.

The upper and lower wings are of different length, the upper wings with a total span of 126 ft., the lower measuring



The Map Shows Clearly the Path Plotted for the Three Big Seaplanes of the United States Navy on Their Journey Trip to Newfoundland, How They Flew Thence through the Darkness on the Night of May 13, and How They "NC-4" Alone Reached the Azores Intact. The "NC-1" Landed in a Stormy Sea Far to the North of Fayal, Still Worse. Landing Like the "NC-1" in a Choppy Sea, but Many Miles to the South of the Azores, It Was Only Skillful Navigation, and the Strictest Economy of the Little Gasoline Remaining Made Possible the Slow

32 ft. less. The distance between wings is 14 ft. at the center and 12 ft. at the tips of the lower wings. Between the upper and lower planes are the four 400-hp. Liberty engines which drive three puller and one pusher propellers, of the peculiar, heavy Olmstead two-blade pattern. It must be remembered that all these power plants are accessible during flight through hatches in the hull and ladders in the rigging.

The navy thus provided its airmen with the best in hull, planes, and motors. But it was realized that these were useless unless supplemented by the most effective and accurate means of communication and navigation. To insure unfailing communication, a triple radio outfit was installed in each boat. Of first importance was the telephone system, with its noise-excluding receiver and transmitter sewed into the helmet of each of the crew. To truly realize the nerve-racking flight these men made on the days in May, one must recall that the four Liberty engines maintained a continuous deafening roar from beginning to end of each leg of the journey. The necessity for this means of communication is evident.

In addition, each ship was fitted with the usual long-distance radio telegraph, and with the improved radio compass, or direction indicator. Storage batteries also operated a lighting system in the hull.

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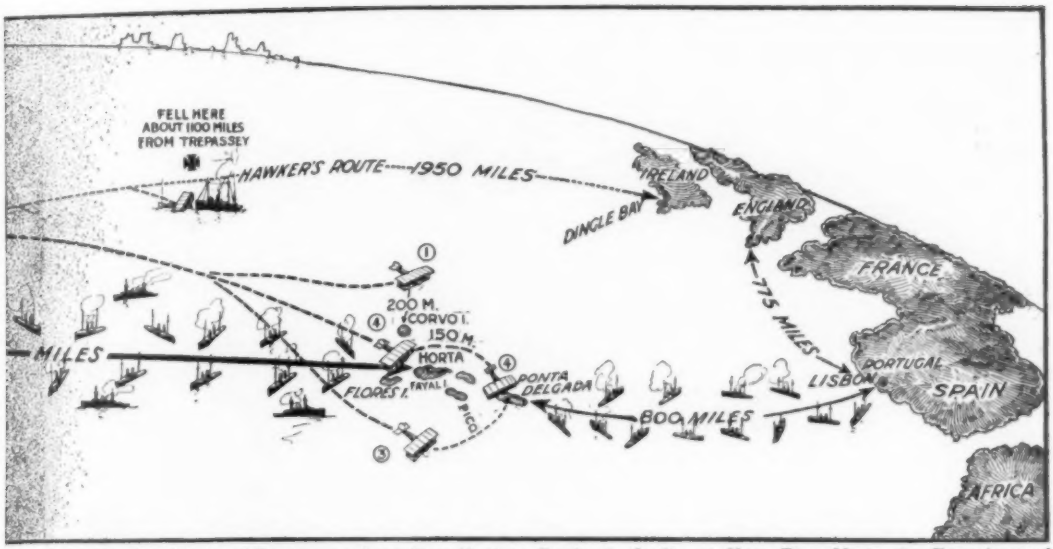
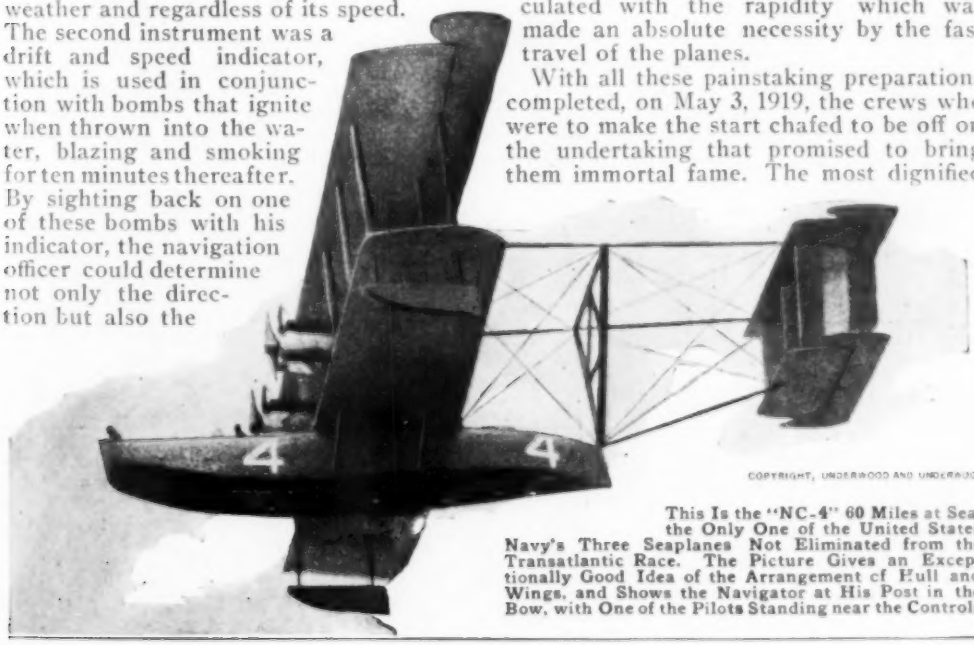
This Is the Sopwith Biplane Which Left Newfoundland on May 18, 1919. It Is Practically a Standard Design, Except That the Cockpit for Both Pilot and Navigator is Set Far Back of the Engine to Give Room for the Huge 330-Gallon Gasoline Tank. It will Also be Seen That the Rear Covering of the Fuselage is Formed by the Hull of a Small Lifeboat Which may be Unstrapped in Case of Emergency



over the Guardian Chain of Destroyers from New York to England. It Shows How They Made the Experimental Parted Shortly after Dawn, Later Meeting the Unexpected Fog Which Kept Two of Them from Their Goal. The Breaking Wings and Hull so That It Sank Several Days Later While being Towed to Port. The "NC-3" Fared Unable to Rise Again. Its Wireless Being Ineffective, the Plane was Mourned as Lost for Two Days and Nights. Journey to Ponta Delgada. The Chart Also Shows the Projected Route of Hawker's Attempt and Where He was Rescued

And for the use of the all-important navigating officer at his post in the bow, three new instruments were devised. The first, the aerial sextant, used a bubble in a tube in place of the horizon, which is often obscured by clouds or else is too dim to be spotted. The instrument thus enables the navigator to ascertain the exact location of his ship in all kinds of weather and regardless of its speed. The second instrument was a drift and speed indicator, which is used in conjunction with bombs that ignite when thrown into the water, blazing and smoking for ten minutes thereafter. By sighting back on one of these bombs with his indicator, the navigation officer could determine not only the direction but also the velocity of the wind, and was thus able to make the correct allowance for drift in figuring his course. And thirdly, each navigator was given a course and distance indicator which obviated almost all the usual mathematical calculation. Equipped with these instruments and the best charts the navy could compile, it was possible for the positions to be calculated with the rapidity which was made an absolute necessity by the fast travel of the planes.

With all these painstaking preparations completed, on May 3, 1919, the crews who were to make the start chafed to be off on the undertaking that promised to bring them immortal fame. The most dignified



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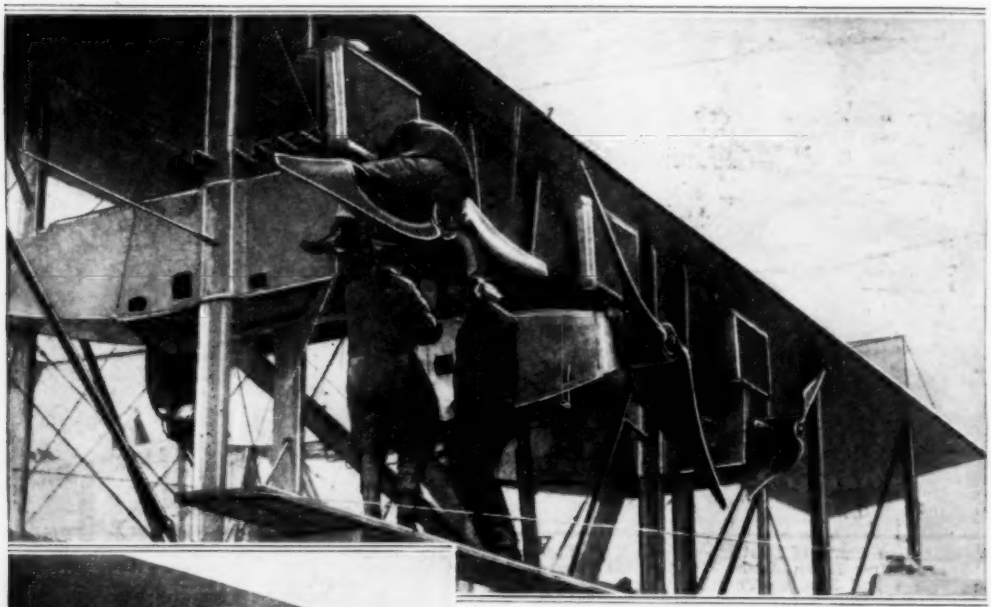
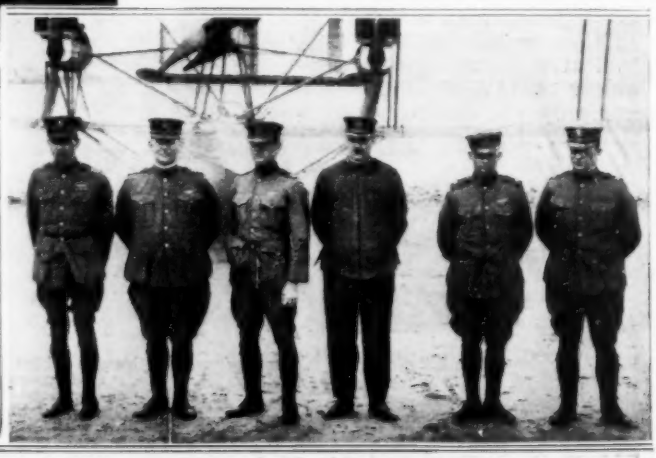
This Is the "NC-4" 60 Miles at Sea, the Only One of the United States Navy's Three Seaplanes Not Eliminated from the Transatlantic Race. The Picture Gives an Exceptionally Good Idea of the Arrangement of Hull and Wings, and Shows the Navigator at His Post in the Bow, with One of the Pilots Standing near the Controls



gold-striper and the humblest mechanics at the air station shared their enthusiasm and impatience. So the gasoline fire which consumed a wing of the "NC-1" and ate an elevator from the "NC-4" on May 5 was a tremendous blow to everyone. But Commander John H. Towers, the resourceful young "admiral" of the air fleet, was undaunted. Telephoning the base plant, he ordered that the "NC-2" be further dismantled, to furnish wings for the "NC-1" and elevators for the "NC-4." Working feverishly all night, the loyal mechanics pointed with pride in the morning to three ships ready to start once more.

But not till two days later, till the morning of May 8, was the word given by the



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In the Upper Picture will be Seen the Quadruple Power Plant of the "NC-4" Which Drove Her without a Stop from Newfoundland to the Azores. Each Engine Revolved a Propeller, Three Arranged as Pullers and One as a Pusher. In the Center is Shown the Bow of the "NC-3" Fitted with Torches for Night Landings, and Below Is Its Crew. From Left to Right They Are: Commander John H. Towers, Officer in Charge and Navigator; Commander Richardson and Lieutenant McCullough, Pilots; Lieutenant Commander Lavender, Radio Operator; Machinist Moore; and Lieutenant Rhodes, a Reserve Pilot Who was Left at Newfoundland

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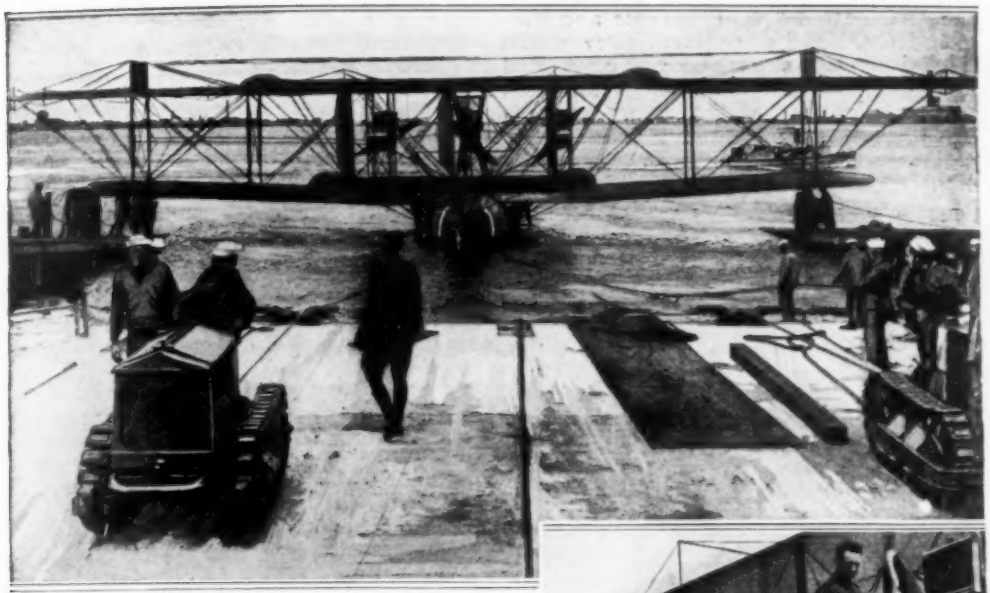

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weather bureau. That day being fair, the division rose from the water at Rockaway Beach, while members of the post and a privileged number of civilians stood quietly along the shore, too impressed to cheer. The flagship "NC-3," under Commander John H. Towers, took the air at 10:02 a. m.; the "NC-4," Commander Albert C. Read, at 10:03 a. m., and the "NC-1," Commander Patrick N. L. Bellinger, at 10:09 a. m. Assuming a wedge formation, the "NC-3" in the center, they headed northward and soon were lost to the sight of the watchers.

The trip to Halifax was, on the whole, an uneventful but instructive experience. The division kept formation till north of Cape Cod, where the "NC-4" developed trouble in

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At the Top of the Page Two Tractors are Seen Drawing the "NC-1" Ashore after a Practice Flight at Rockaway Beach, Long Island. The Two Pilots in the Center are Using a Plumb Bob in the Careful Adjustment of Their Compass. In the Lower Picture, Standing before Their Plane Which Now Rests on the Ocean Bottom, Is the Crew of the "NC-1." From Left to Right They Are: Lieutenant Commander P. N. L. Bellinger, Officer in Charge and Navigator; Lieutenant Commander Mitscher and Lieutenant Barin, Pilots; Lieutenant Sadenwater, Radio Operator; Chief Machinist's Mate Kesler, and Machinist Christensen, Left at Newfoundland

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two engines and glided to the water. On the "NC-3" and "NC-1" motors and controls NC worked smoothly, however, and the 540-mile trip to Halifax was completed in about nine hours. The "NC-4" was meanwile unheard from, as its wireless had failed it. But next morning it rode into Chatham, Mass., where it was fitted with two new Liberties, and during the next few days was tuned up once more.

Both commanders and crews became thoroughly acquainted with the equipment during this first lap of the journey. The directional wireless was tested, telephone communication used constantly, navigators became accustomed to picking up the stationary destroyers by their plumes of smoke, while the pilots profited by experience in extremely "bumpy" weather. The only real discomfort was suffered by the commanders, who skinned knuckles and knees while making their awkward tours of inspection along the hull and rigging.

Two cracked propellers being discovered on the morning of May 9, the "NC-1" and "NC-3" were held at Halifax until May 10 while the propellers were replaced, the interval also being used for additional "tuning up."

On the morning of that day they left on the jump to Trepassey Bay, Newfoundland. The "NC-1" rose at 8:49 a. m., rode the 460 miles with ease, and touched water in Trepassey Bay at 4:14 p. m. The "NC-3" was unfortunately compelled to return for a new propeller when just out of Halifax, and was thus unable to reach the shelter of Trepassey Bay until 7:50 p. m. the same evening.

And there, most luckily for the "NC-4," the planes were held by poor weather until the evening of May 15. On that evening they tried to leave the water with too large a cargo of gasoline, and were unsuccessful. In the midst of their attempt the belated "NC-4" appeared. Considering this a good omen, Commander Towers postponed the historic jump-off till the following day.

On May 16, everything was in his favor, boats groomed, weather ideal, and men in the pink of condition. So toward sunset the fateful order was given. At 10:03 p. m. the "NC-3" slipped from the friendly water of Trepassey Bay; at 10:05 p. m. the "NC-4," and at 10:09 the "NC-1."

Soon they met the black night which blotted everything from view except the lights of the other planes, and the regular succession of blazing destroyers which advertised their position 40 miles away with searchlights and bursting star shells.

About midnight appeared the bright May moon in a cloudless sky. And shortly after, the formation loosening, the planes seem to have flown on independently.

Passing over a surprised merchant ship shortly after this, the "NC-4" flew on without trouble until 8:00 a. m. At that hour fog began to slip by in little lumps. At 9:30 it thickened, and at 9:45 was so dense that the sun could not be seen.

WINGS

By CHARLTON LAWRENCE EDHOLM

THAT a poet is not infrequently a seer also is again evidenced by the verses republished here. These lines appeared in Popular Mechanics Magazine for September, 1909. They were inspired by Bleriot's flight across the English Channel, on July 25 of that year. Subsequent events make them even more appropriate today, while their beauty is imperishable.—Editor.

THE hand of man, emerging from the mist
Of primal ages, was a hairy fist,
All blood-bedabbled; for the hand had killed
Before it learned to sow and reap and build.
So each new tool was but a weapon, fit
To add new terrors to the blow of it:
The first rude ax was formed for bloody deed,
Split skulls before it served the builder's need.
And thus through ages runs the tale; by worst
Of uses is the new-found tool accurst,
Yet we believe what prophet's words record,
That into plowshares men shall beat the sword.

For centuries we stood upon the edge
Of space and yearned, while sparrows from the hedge
Took flight and taunted us. "That I had wings!"
'Mid stormy music, thus the Psalmist sings,
"Then would I fly away and be at rest!"
And lo, the wings are ours, a gift, the best
The genius of our race has forged; a tool
Fit for our eager age. What says the fool,
The War brute? "This is mine, for brawls and strife,
As hawk wings are the hawk's—for taking life!"

Well, claim them, War god! Use them till the race
Will kill for you no more. What narrow space
Holds man today apart from brother man,
A range of rock, a river or a span
Of channel; and our wings shall overleap
These dwarfish landmarks. Then what king shall keep
His folk from merging with humanity
As waters intermingle in the sea?

Sail forth, winged Argonauts of trackless air,
And as upon your homeward course you fare
Bring heav'nly treasure. Neither gold nor steel,
Nor gross and earthy wealth weight your light keel;
Man's brotherhood, bring that as Golden Fleece
On sun-blest wings, bright harbingers of peace.

But soon after, to the joy of the navigator, the ship was able to rise above the mist and sail on over the fluffy expanse. At 11:27 a rift in the clouds showed a stretch of tidewater below, and two minutes later he was able to show the pilots a rocky coast that proved to be Flores Island, the westernmost of the Azores. Swooping close to the beach, they found destroyer "No. 22," and rose again in an attempt to reach Ponta Delgada, some 300 miles away.

When halfway there, however, the fog closed in again and at approximately 1:00 p. m., May 17, the good ship was brought to the water in a small bay on the Island of Fayal. Locating himself, the commander gave the order to fly on, and at 1:23 p. m. he landed in Horta Bay and brought his plane to rest beside the cruiser "Columbia." He reported that his elapsed time was 15 hr. 18 min., giving him an average speed of 81.7 nautical miles per hour. His plane needing only light repairs, it rested here until the morning of May 20, when it took flight for Ponta Delgada, making the 150 miles in 1 hr. 44 minutes.

Meanwhile the "NC-1" and "NC-3" had fared less fortunately. Traveling not quite as fast as the "NC-4," they were thoroughly trapped in the fog and rain of May 17. The "NC-1" saw its last destroyer, "No. 18," at 11:10 a. m., May 17, after which it lost its course. Two hours later, knowing that he was in the approximate location of the Azores, the commander directed his pilots to halt his ship on the surface of the water. Despite their skill, the choppy sea damaged both lower planes, tore away one pontoon, and smashed an elevator. This was the "NC-1's" deathblow. Calculation showed them to be about 100 miles northwest of Fayal. At 7:20 p. m. a small boat from the steamer "Ionia," on her way to Gibraltar, made a perilous trip to the wrecked plane and brought off the crew. An effort was also made to tow the seaplane to port, but the line parted and it was left to its fate. Later, however, the destroyer "Fairfax" attempted salvage, but was likewise unsuccessful. On the afternoon of May 20, a few miles north of Corvo, the "NC-1" sank from sight.

But the greatest tribulation was reserved for the "NC-3." Trouble started about 1:00 a. m., May 17, when the lights on the instrument board went out. This necessitated a climb above the clouds to enable the navigator to use the stars for reference. And here, it seems, winds of unexpectedly high velocity blew the plane off its course. A parallel path was followed with some success, however, until, between destroyers "17" and "18," the route was lost altogether. At 11:30 in the morning of May 17, Commander Towers decided that a halt should be made to permit more accurate observation. And, like the "NC-1," his plane was so damaged that it could not rise again. Calculations showed his position to be 60 miles southwest of Pico, or about 200 west of Ponta Delgada. Long before, the wireless had broken, diminishing the chance of rescue. And during the evening of the 17th, a vicious gale arose. Continuing during the 18th, it is calculated to have reached a velocity of 90 miles an hour. Although the sturdy hull took the punishment splendidly, the men were forced to take turns at manning the pumps, and were even forced to stand on the wings to preserve the balance. During this day, too, the water supply ran low, and the exhausted crew was forced to drink from the radiators. On the morning of May 19, however, the wind

The Crumpling of the Frail Undercarriage on This Martinsyde Biplane Wrecked the Machine as It Set Out to Overtake Hawker, on May 18, 1919. Raynham, the Pilot, Had Every Hope of Beating His Competitor as His Plane was Considered Much Speedier, Although the Lowest-Powered of Any in the Race. Morgan, the Navigator, Later Injured in the Crash, is Seen in Conversation with the Rival Sopwith Team

and waves subsided and a start was made for Ponta Delgada. Trailing its wings on the water like a crippled bird, it "taxied" steadily eastward till 5:50 p. m., when it drew into the breakwater as crowds cheered and guns fired salvos of welcome. Investigation showed the damage to be so serious that it was disassembled and is now on its way to New York.

Thus did the "NC-3," "NC-1," and "NC-4" make America's bid for transatlantic laurels. With the "NC-3" dismantled and the "NC-1" on the bottom of the sea, the "NC-4" alone carried the hopes of America on its 800-mile jump to Lisbon.

On May 27, ten hours after leaving the Azores, the "NC-4" glided into Lisbon harbor, the first airship of any kind to make the historic journey.

The whole world watched the flight of the American flying boats, but nowhere was interest as keen or appreciative as in Newfoundland. Here was a big Vickers-Vimy bomber and a huge Handley Page, on both of which mechanics were ceaselessly at work. And at their hangars near St. John's, where they had been confined by unfavorable weather for weary weeks, were the Martinsyde team and the rival Sopwith plane. Knowing ones watched Harry G. Hawker, the pilot of the 375-hp. Sopwith, with particular interest. They had heard, and firmly believed, that he had vowed "to beat the Yankees across."

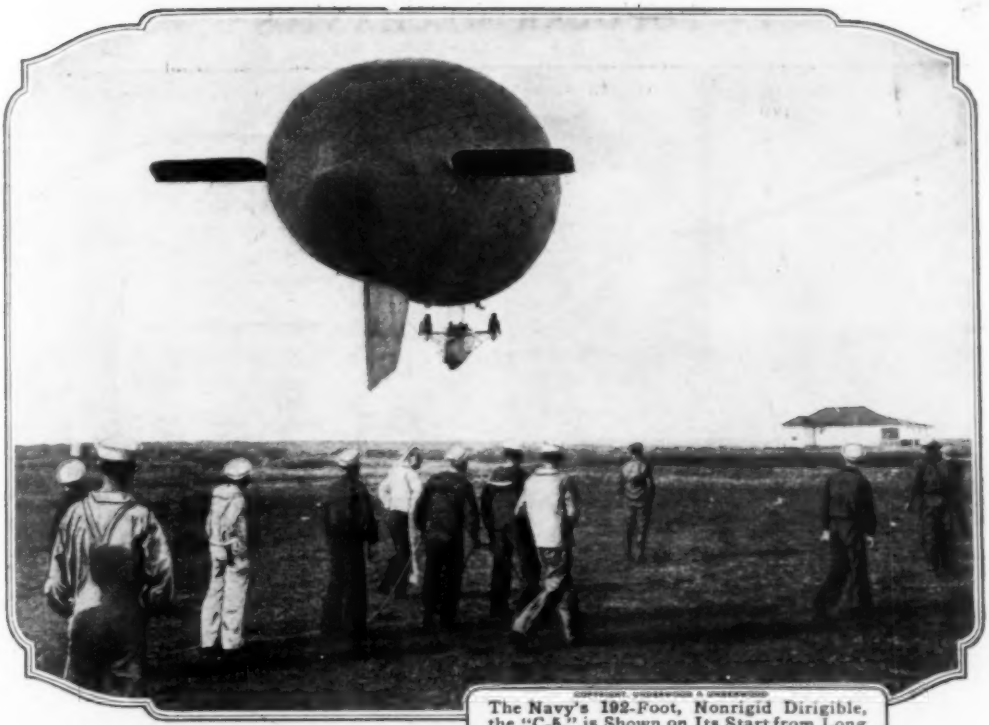
And at noon of May 18, as the American "NC-1" rode in the harbor at Horta—two-thirds of the coveted journey accomplished—Hawker went into consultation with the weather experts. He found that conditions were far from perfect; yet he calmly prepared to make good his word. At 3:00 p. m., local time, the official starter arrived at the Mt. Pearl aerodrome outside of St. John's. And at 3:15 Hawker and Lieutenant Commander Mackenzie Grieve, his navigator, pulled their inflatable rubber suits over their woolen flying clothes. Calmly they climbed into their cramped quarters, gave the word, and at 3:21 rose from the ground.

The little group at the lonely aerodrome saw the plane circle to gain altitude, straighten out, and fly eastward over the city—and over the hangar of the rival Martinsyde, too, where a skeptical crowd had gathered on hearing of Hawker's decision. But the most skeptical knew the race was on, as the dwindling Sopwith sped over the white cliffs of the coast, and the steel undercarriage was seen to fall away. Then—six long days of silence.

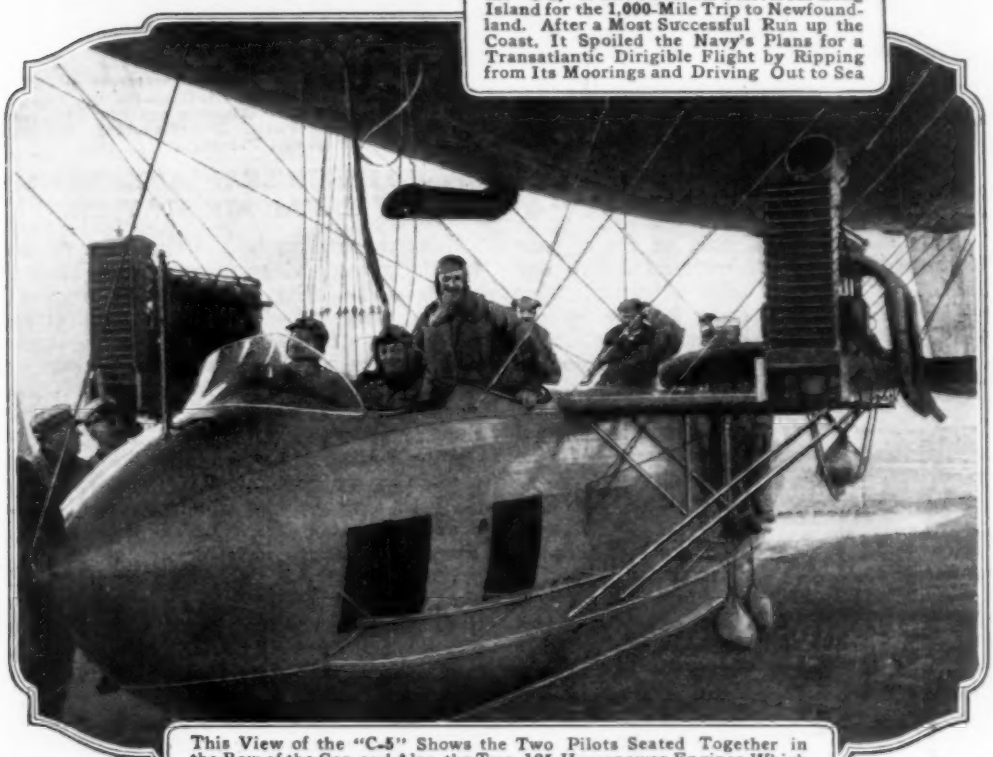
Hawker and Grieve were reluctantly mourned as dead by all except the pilot's wife. And on May 25 she was justified, as she learned how the heroic pair had been forced to the water by defective water circulation when 800 miles from Ireland; how they had been picked up by a northbound tramp unequipped with wireless after a wait of 90 minutes, and finally how the grateful British government had dispatched a destroyer to overtake the little steamer and return the airmen to a jubilant nation.

Meanwhile at Quidi Vidi, Raynham conferred with his navigator, Morgan. They had previously decided that their attempt would be made between 5:00 and 6:00 in the evening. But discretion was abandoned as love of the race grew upon them, and at 4:15 they too were ready for the start. Rolling over the bumpy ground at 40 miles an hour, Raynham was on the point of pulling his heavily burdened machine into the air, when the running gear smashed into a crossridge, and threw the machine on its nose, thus eliminating the Martinsyde from all immediate competition.

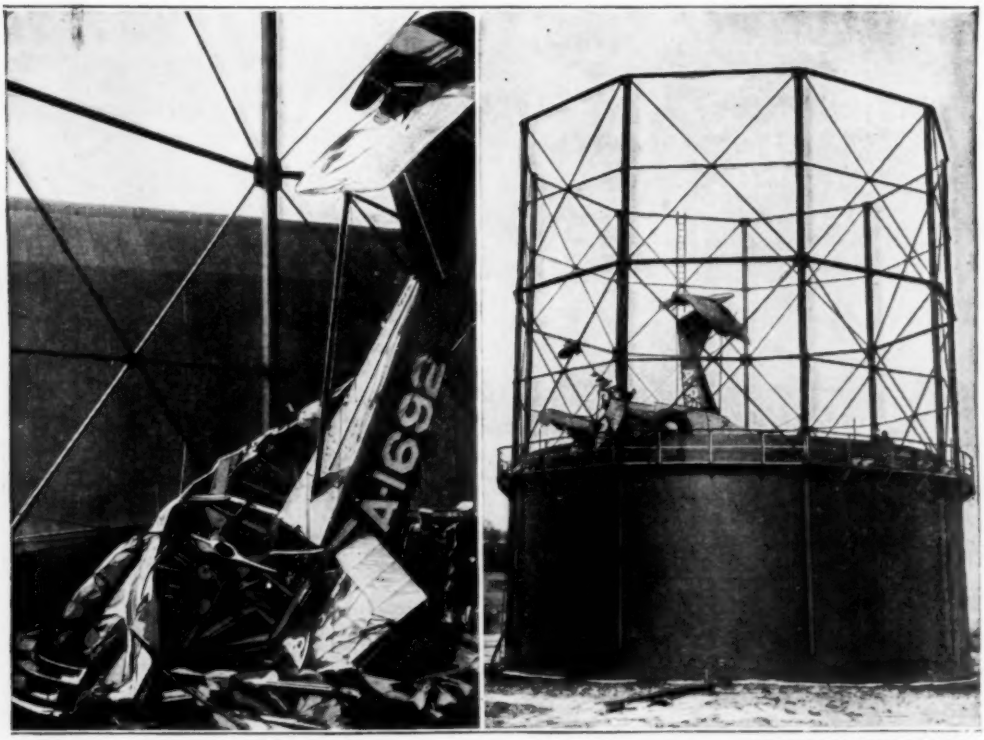
Finally mention must be made of the unfortunate "C-5," the navy's 192-ft. nonrigid dirigible which blew out to sea on May 15. Its 1,000-mile experimental trip from Montauk Point, New York, to St. John's, was accomplished so satisfactorily, despite heavy fog and unfavorable wind, that hope ran high for a transatlantic trip. It would have been a dangerous undertaking for the little bag, but advantage could probably have been taken of the careful safeguards provided for the three seaplanes. Unluckily, however, no hangar was provided at Quidi Vidi, and on the evening of May 15, the wind blowing from 30 to 40 miles an hour, the land crew of 100 men was able to hold it on the ground with difficulty. Pitching and tossing, stripping its bottom of the canvas covering, the unlucky "blimp" at length became altogether unmanageable. Ordering his companions to leave the ship, the lieutenant in charge tugged at the rip cord, in an endeavor to deflate the bag. At this moment the anchor ropes snapped and the plane bounded up on its wild ride into the darkness. Giving one last unsuccessful jerk at the rope, the plucky lieutenant jumped for his life. The "C-5" has been seen no more.



The Navy's 192-Foot, Nonrigid Dirigible, the "C-5," is Shown on Its Start from Long Island for the 1,000-Mile Trip to Newfoundland. After a Most Successful Run up the Coast, It Spoiled the Navy's Plans for a Transatlantic Dirigible Flight by Ripping from Its Moorings and Driving Out to Sea



This View of the "C-5" Shows the Two Pilots Seated Together in the Bow of the Car, and Also the Two 125-Horsepower Engines Which Drove It at a Speed of 50 Miles an Hour. Its Uneventful Trip to Newfoundland Made Its Participation in the Race Seem Certain



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This Unfortunate Mishap was Witnessed by Scores of Reporters and Navy Officials Gathered to Observe Preparations for the Navy's Transatlantic Flight. While Stunting at a Low Altitude over the Land, the Seaplane Slipped into a Nose Dive and Crashed into This Big Hydrogen Tank. The Picture at the Left Shows How the Big Liberty Motor Crushed Both Pilot and Passenger

VENICE GUILDS GIVE COFFER TO NEW YORK CITY

An exhibition and sale of art objects fashioned by Italian craftsmen who had been driven from their homes by the Austrian invasion, recently occurred in New York City. In connection with the exhibition came a graceful courtesy from the guilds of Venice to the city itself in the form of a banner of St. Mark inclosed in a coffer of wrought iron and silver, bearing on top a colored - enamel medallion of the lion of St. Mark, and on the sides the coats of arms of the ancient Venetian cities. The coffer has been given a place of honor in the New York City Hall.

TWO DIE IN SEAPLANE CRASH AT NAVAL AIR STATION

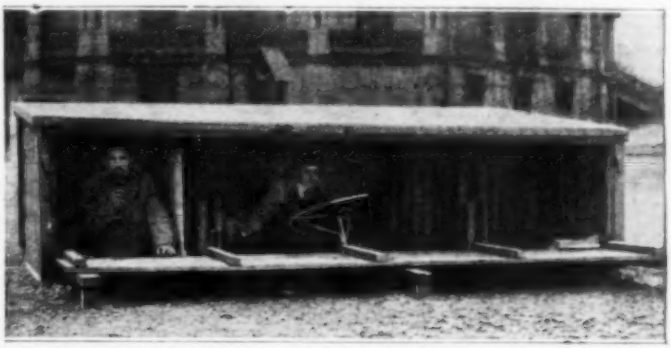
Just three days before the start of the transatlantic NC seaplanes from Rockaway Naval Air Station, two popular young airmen were killed at that station in view of scores of newspaper correspondents and navy men. The ill-fated plane, of the small HS-1 type, rose from the water at 4:00 p. m., with a crack ensign-pilot at the controls and an enlisted man as passenger. Almost immediately the machine was observed to bank steeply to the left, then to the right. The onlookers commented on the daring of the maneuvers. They were astonished again as the seaplane turned inland, at an altitude of barely 300 ft. Another bank followed, this time almost perpendicular. The plane slipped out of control, lazily spun down in a nose dive, and crashed into the cage-like structure of a half-empty gas tank, just eight minutes after leaving the water. The Liberty motor crushed down upon the two men, mangling and killing them. Fire started, too, but quick work by the spectators saved the bodies.

TELEPHONE-MEGAPHONE INSURES FAIRNESS IN REFEREEING TRAPSHOOTING

Trapshooters have added an electrical device to their layout, for the use of the referee. It is essentially the telephone-megaphone arrangement used for announcing trains at large railroad stations. For trapshooting it is installed with the telephone receiver in the trap house, beside the trap from which the targets are thrown, and the megaphones, for there are two, are located back of the firing line, one at each side of the shooters' platform.

Until now the referee has stood back of the shooters; his job is to call the birds "dead" or "lost." There have always been serious objections to this method, for two chief reasons. First, the referee could see the birds no better than the shooters, and consequently his decisions were often questioned, and disagreements were not uncommon, many important matches hinging on the calling of a doubtful "kill." Corollary to this first reason was the second, that the referee always knew who was shooting, which opened the way to favoritism, or, equally bad, charges of it.

By placing the referee nearer the birds



With This Arrangement the Referee Occupies a Compartment of His Own in the Left End of the Trap House, and Reports the Result of Each Shot through the Telephone. He can See the Birds Much Better but cannot See the Shooters at All

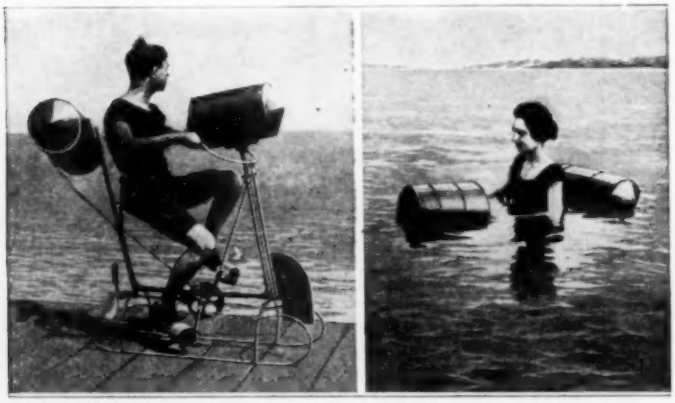
—more than 16 yards nearer—he is naturally in a much better position to see what damage the shot actually does to each flying disk, and he is obliged to be absolutely impartial, since he cannot see the persons shooting.

The electrical device was adapted for the use by a New York marksman, and passed its experimental stage during the spring at the Travers Island traps of the New York Athletic Club. Later it was used at the same traps for the Victory Week Shoot, when several important championships, including the Amateur Championship of America, were decided. It was at this time that trapshooters from all sections of the country were given an opportunity to witness the new method of refereeing. Their approval was so general that trapshooting clubs, particularly those which hold large tournaments, are planning to install the equipment without delay. Trapshooting is an all-year sport, and any improvement is particularly valuable.

The Loud-Speaking Telephone Receiver at the Shooters' Platform Gives the Referee's Report of Each Shot without Prejudice or Favor

NEW WATER BICYCLES ADD TO JOY OF BATHERS

A water bicycle that imitates the submarine, in that it operates almost entirely submerged, has appeared in the East in time to contribute a new pleasure to the bathing-beach season. Only the rider's head and shoulders appear above the water, the machine being buoyed up by two air floats, of 8 to 10-gal. capacity, placed breast-high at front and back. The cycle's immunity to rough seas promises usefulness for beach rescue work.



This Submersible Water Bicycle Operates with a Propeller and Steers with a Front Rudder, as Seen at the Left. The Air Tanks Keep Machine and Rider Afloat, as the Right-Hand Picture Illustrates

An English floating bicycle has also just made its appearance. Primarily a land vehicle, it owes its seaworthiness to a boatlike pontoon at each side.

Mounted on this amphibious contrivance, the rider is able to run from the beach into the sea, and back again, or to ford a stream, at his pleasure.

PHOTOS BY GILLIAMS SERVICE

This English Bicycle Rides Like Any Other on Land, as the Left View Indicates. The Right Picture Shows How the Pontoons at the Sides Float the Machine in Water

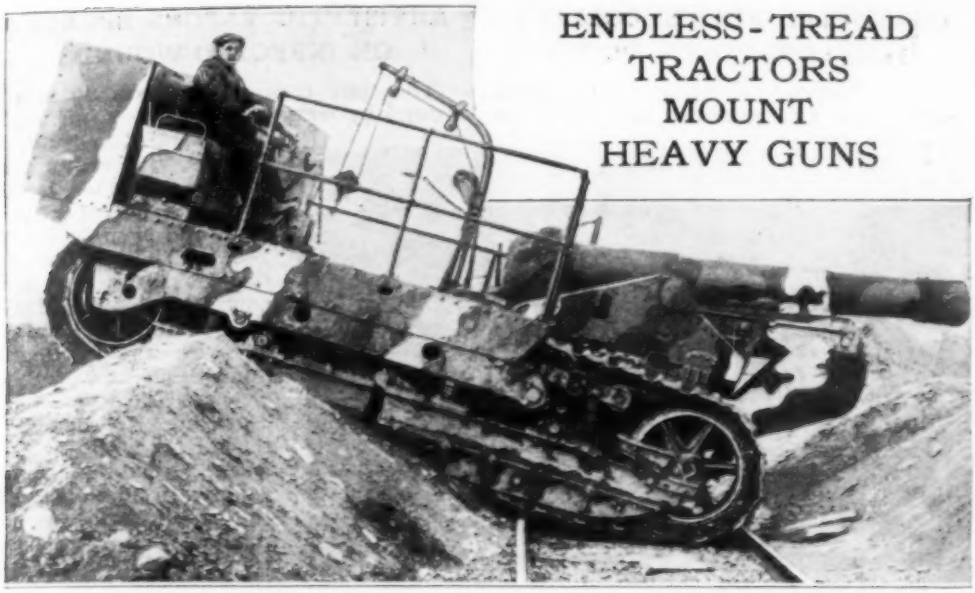
WEALTH OF GOLD IN SIBERIA; MINERALS OF ALL KINDS

An inscrutable dispensation seems to have placed the greatest mineral wealth in those lands least able to develop it. Siberia is a case in point. The eastern half of that vast domain is exceedingly rich in mineral deposits, which run the gamut from gold, silver, and precious stones to graphite and salt. In the Ussuri region, north of Vladivostok, gold is found everywhere, and only lack of enterprise and facilities prevents extensive development. There is, indeed, more or less gold in practically every Siberian province, though much of it is in deposits of low content. In the steppes considerable silver is found, though by no means confined to that region. Good iron is quite widespread. Coal also is abundant, some of it excellent in quality. The Altai Mountains are rich in copper, as is the Kirghiz steppe; and in other localities a rather low content is compensated by proximity to coal. Most of the metals, rare or common, occur at one point or another, as well as various valuable chemicals, oil, mica, asbestos, and graphite. Though diamonds are rare and of small size, other precious and semiprecious stones, and some varieties of marble, are found in workable quantities. Present workings are insignificant compared with the supply.

MAKE BIG GUN BY SHRINKING LINER INTO PLACE

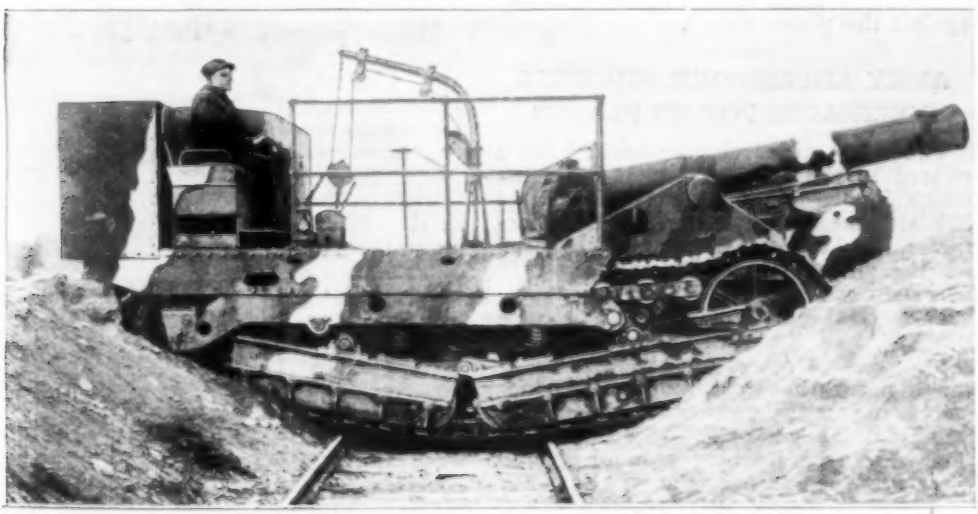
In making a 12-in. gun at an eastern arsenal, the liner tube, 36 ft. long, was finished and rifled before being shrunk into place. Customarily the liner is finebored and rifled after the shrinking operation, and this is declared to be the first time a gun of such large size was ever assembled after the tube was finished.

ENDLESS-TREAD TRACTORS MOUNT HEAVY GUNS



This Eight-Inch Howitzer is Mounted Directly on a Self-Propelling Base, and is Thus Easily Moved to the Battery Position and Quickly Aimed in the Direction of the Enemy. It Is Another Indication of the Growing Use of the Gasoline Engine in Every Branch of the Artillery Organization

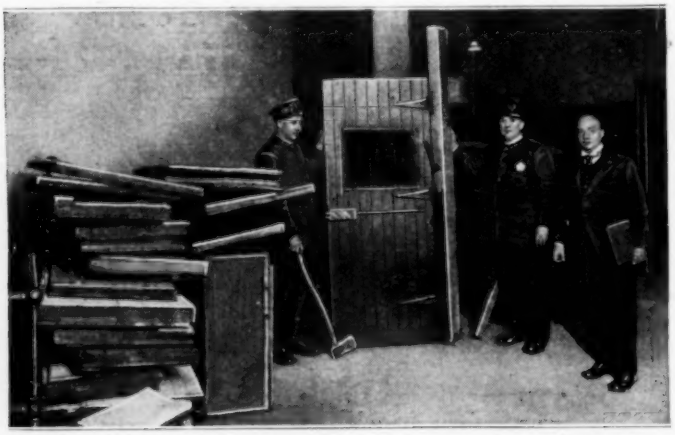
No phase of the development in artillery practice during the war has been more marked than the substitution of the gasoline engine for the horse in almost every conceivable way. A single truck or tractor now pulls the big rifle, or howitzer, displacing three or four teams of horses; huge supply trucks supplant commissary wagons and ammunition caissons; mobile repair shops roll their way almost into the front lines. And one of the latest advances in this motorizing process is represented in the illustration. Heavy guns are mounted directly on self-propelled platforms which climb a 40° grade easily, travel 12 miles an hour on the level, and can go into action the instant they arrive at the battery position. The mounting also facilitates aiming to the right or left, relieving the gun crew of this heavy duty.



The Self-Propelling Howitzer is Shown Here in Firing Position. A Mounting of This Sort Increases Tremendously the Mobility of These Big Weapons, in Addition to Making Them Easy to Operate. Ammunition and Supplies may Easily be Transported on the Same Carriage

COAST-CITY POLICE COLLECT GAMBLING-HOUSE DOORS

As a hobby, collecting takes many forms, but the greatest collection on earth, presumably, of gambling-house doors was recently acquired in the line of duty by the Portland, Ore., police. The locks and buzzer signals of the Chinese quarter were made illegal by ordinance of the city council, and in enforcing the order the police frequently have to take the doors and sometimes the frames as well. Most of the doors are extremely strong and heavy. The department now has over a hundred of them. All doors collected in raids were held as evidence against the places raided.



Part of the Notable Collection of Doors Taken by the Police from Chinese Gambling Houses in Portland, Oregon: Note the Heavy Hinges and Locks and the Solid Construction of These Bars to Law and Order

ARMY AIR SERVICE SUGGESTS CONTRACTS FOR 500 PLANES

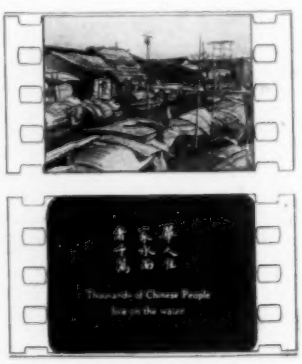
The army air-service authorities have offered to the Secretary of War a plan which involves the purchase of at least 500 airplanes from American manufacturers. As there is no immediate need for the planes, the purpose is simply to stimulate the airplane industry and prevent a slacking of interest and efficiency. Coupled with this plan go the names of seven types of planes approved as representative of the most modern developments in the science of airplane construction. They are the Le Père observation plane, the Loening monoplane, the Thomas Morse scout, the U. S. D9-A day bomber, the Vought training plane, the Martin day bomber, and the ordnance-engineering pursuit plane.

ANTISEPTIC VAPORS SPRAYED ON INFECTED WOUNDS

The time required to clean up a bad wound by irrigating it with an antiseptic fluid is stated to be about 10 days. But with a new method the time is reported to be cut to two days, and even 24 hours, and in addition the patient is spared the discomfort of lying in a bed, continually saturated with the antiseptic fluid. This new method cleanses the wound by "spraying" it with a current of gas with which is mixed some antiseptic vapor. In administering the treatment, air is pumped into a flask which contains a mixture of ether and some volatile antiseptic. Emerging thoroughly medicated from the flask, the air passes through a rubber hose and down an aseptic tube to the heart of the wound, where it penetrates to every portion of the affected area. By maintaining this action continuously for 48 hours, it has been possible to conquer the most stubborn cases of infection.

CHINATOWN HAS OWN MOVIES FOR COMMUNITY WORK

Motion pictures, in which not only the subjects but the titles and reading inserts are Chinese, are now used for community work in New York's Chinatown, and similar settlements in other communities. English translations appear on all leaders, however, the object being to assist in teaching American standards to the aliens from the Flowery Kingdom. The series of such films now in process of preparation will also be distributed in China.



COMMENT AND REVIEW

[These pages were printed May 26, 1919]

ONE of the things which this country will bring out of the war is an increased interest in securities by people who never before considered such investment. The small investor formerly thought of bonds and stocks only in terms of thousands, wholly beyond his reach, and as entirely belonging to banks and men of wealth. The war-savings stamps, and the government bonds of $50 denomination up, have not only encouraged thrift, but have opened the eyes of the multitude to the fact that to be a bond owner does not require a king's ransom. Now we have some 20 million bondholders, and where formerly only 1 person in 7 was thrifty, now 5 out of every 7 are savers. We do not measure up to the stern thriftiness of the French, who, by extreme economy, paid off the war indemnity which the Franco-Prussian war occasioned, in an incredibly short time. But proportionately we have made a good start, for we have from the beginning been a nation of wholesale wasters because our resources of every kind were so enormous. Some were even ashamed to save and thought it smart to spend lavishly as fast as they earned. This condition permeated the entire land. We may well take genuine pride in a good start on the road to sound common sense and thrift. The very act of saving increases self-respect. The flowery speeches of a thousand orators in more than a century are forgotten, while these words of wisdom by Benjamin Franklin live on:

War Taught Saving Habit

> "Save a little of thy income, and thy hide-bound pocket will soon begin to thrive and thou wilt never cry again with an empty stomach; neither will creditors insult thee, nor want oppress, nor hunger bite, nor will nakedness freeze thee. The whole hemisphere will shine brighter, and pleasure spring up in every corner of thy heart.
>
> "Remember that money is of a prolific, generating nature. Money can beget money, and its offspring can beget more, and so on. Five shillings turned is six, turned again it is seven and threepence, and so on till it becomes one hundred pounds."

Time was when good bonds were issued chiefly in denominations of $1,000, with an occasional small proportion of $500 units. To the beginner, the time required to save enough to buy one bond was so long, he was discouraged in even making the attempt. Now excellent securities of all kinds can be had in $100 units, which increases the number of possible buyers by thousands. Once more the frequent caution: Before buying, or exchanging, be sure to consult a good banker and so avoid losses.

SINCE our previous issue there has passed away a business man of world-wide reputation, whose monument is the highest and most notable business building in the world, and whose success was built on the greatness of small things. The profits on articles of merchandise, which retailed at 5 and 10 cents each, in a thousand stores, accomplished all this. It furnishes one of the most impressive examples of what thrift and industry and square dealing, consistently applied, can accomplish.

Greatness of Small Things

Woolworth began in a very humble way, as a small merchant in a country town. He conceived an idea, and all his life confined himself religiously to that one effort. Even when he had acquired a vast fortune, when most men under similar circumstances are tempted to, and usually do, branch out in lines unfamiliar to them, he held himself steadfastly to his one idea. It is true he expanded, but it was always along the one line. That he possessed a natural ability to accomplish what he did, is obviously true, and it is not given to all of us to measure up to his success; yet is it equally true that many another man has possessed the same talent as he, who has failed to exert the same industry and steadfastness of purpose, and has consequently never been heard of. Nor did he possess the same ability during the first few years, that marked the last 10 years of his life. The germ was there, but it was cultivated and nourished, and each year brought additional experience and strength.

We cannot all be Woolworths, but the least of us can profit by his example, and so add to some extent to our usefulness and worth in the world. When he started out he never dreamed of the high pinnacle in business or vast wealth he eventually attained. His mind and effort were wholly concerned in doing a

thing which was worth while, just the best he could. Riches and fame resulted, and both are naturally a gratification and pride to any man. To the young man with little or no capital except a high standard of business morals and an indefatigable purpose to succeed, his success furnishes a brilliant example.

THE experiment of national rule under the Bolshevistic plan is not without its good purpose in the end, though horrible in the extreme to its immediate victims, and disastrous to the country. The tyranny of czars, especially during the past 20 years, was mild and childlike compared with the present unbridled use of power in the hands of the ignorant and unrestrained. It will burn itself out in time, and sober-minded, intelligent minds must ultimately take up the task of bringing order and security out of the present chaos. One awful principle alone, that of making women the property of the state and thereby the slaves of many men, spells ultimate failure to the system. Even the cavemen, of thousands of years ago, had a better, higher standard of morals. That any "ism" could claim any possible progress in so going back to pre-savage days is both monstrous and inconceivable. As it stands now, the male head of every family is subject to severe penalties, who fails to report and surrender to the local authorities every female member of his family between the ages of 17 and 32.

The Russian Experiment

And yet there are in this country women of social standing and wealth who from public platforms defend and favor Bolshevism and the I. W. W., which means practically the same thing. Such men and women are a menace equally to every family in the land, from the poorest to the richest, and deserve to be confined in asylums for the insane.

In this connection it is disheartening to note to what extent, on technical grounds, many I. W. W.'s, who were fairly tried and properly sentenced by Judge Landis only a few weeks ago, are already coming out of prison; and that those who were ordered deported long ago, are still in this country. The most of us seem to have the backbone of a caterpillar, so far as exerting any effective public sentiment to combat these things. The I. W. W.'s having nothing else to do, spend all their time organizing and in propaganda; but are the things, however worth while, which occupy our time, really any more so than to combat this menace? When occurs a flood, a cyclone, a fire, a pest of smallpox or flu, then everyone gets busy and applies the proper remedies: we do things. But with the I. W. W. and similar dangers, we merely talk mildly, or not at all.

To return to Russia. Lenine's latest is an additional demonstration of what he doesn't know. He has announced that money, that token of exchange which goes back thousands of years in all countries, is a prime cause of trouble; therefore, he would abolish it. As one means, he runs the government printing presses night and day, turning out tons of rubles. These rubles, which under a former government were worth 50 cents of our money, are rapidly reaching a point where they may best be quoted at so much per pound, or ton.

Instead of money, Lenine would make a direct exchange of labor the commodity; in other words, return to barter. For instance, he who wanted sausage could shovel off the snow on the butcher's walk; just what happens to the second and third buyer who wants sausage when there are no more walks left to clean, is not explained, nor what in southern Russia where they have little or no snow.

Of course this method has the advantage of doing away with exchange between places more than a few miles apart, for how could a man in Chicago, wanting something in New York, clean a sidewalk or mop a floor, or whitewash a ceiling 1,000 miles away? However, Lenine hopes to simplify these difficulties by establishing government local stores, where all the people of the surrounding district will be credited with their day's work for the government, and where they can draw supplies to the amount of their credit earned. With only one store at which to trade, much lost motion is saved, and "shopping" as known to us would speedily become a lost art. Also, with only one store, all competition is removed, and if the buyer fails to like the goods or treatment he receives, all he has to do is to stop buying and go without. It's a beautiful scheme in a way, because it's so simple, and automatically does away with all banks and other present machinery for saving, for nobody owns anything to speak of, beyond the clothes he wears and a little house furniture. As the government would own all lands and industries, there would be nothing to leave to one's family, which would save a lot of trouble over wills and dispense entirely with litigation.

And these are just a suggestion of the things Bolshevists would have us adopt in place of our present laws and individual ownership; and the I. W. W.'s are like unto them.

If anybody in this country feels their happiness depends on having these and similar conditions, they should lose no time in getting into the Bolshevist band wagon and emigrating to such parts of Russia as are endeavoring to establish these "reforms." As for the rest of us, who are overwhelmingly the most of us, we won't stand for it.

After Many Days

IT was most fitting that the day appointed for delivering the treaty of peace to Germany should be the anniversary of the sinking of the "Lusitania." But what a contrast in conditions! When that ship went down, Germany was at the apex of her military strength, and her women and children paraded with bands and banners to celebrate the death of other women and children. The vast military machine throbbed with exultant power. Only 48 months later the gigantic engine of destruction itself lay shattered, its leader a fugitive to the sanctuary of a neutral country, previously too insignificant to notice.

Not until the allies had determined fully, was the vanquished told to send its delegation upon a certain day. While the German delegation entered, the assemblage, including the great men of many nations, stood upon its feet. When the time came for the German delegation to reply, its spokesman, Count von Brockdorff-Rantzau, and his associates studiously insulted the body by remaining seated while delivering his reply. The incident, by reason of its extreme crudity—like a small child who makes faces at another—becomes ludicrous, but emphasizes and calls to all the world to witness the boorish character of a Hun, which around the peace table, as elsewhere, is out of step with all the world. The American Indians, skilled as they were in hair lifting, and terrible in warfare, never so far forgot themselves as to fail to rise when addressing their enemies at a peace council.

If the Huns have hopes of earning a seat in the family of nations, they will have to reverse their lifelong attitude, and instead of estimating the world with a German yardstick, will have to take an inventory of themselves as regarded by the world.

Peace Terms Fair

WHEN a bill, increased daily, is allowed to remain unpaid for four years, it naturally assumes large proportions. The Huns went on a big military spree and, while shooting up Belgian and French towns was rare sport for a while, there must come an end to all revels. The Huns are now going through the sobering-up process with the usual next-day sensations, and a conviction that everybody else was to blame. There is no sentiment about the judge, however, who declares the broken glass and furniture must be paid for, and bonds given to keep the peace. Meanwhile the disturber of the peace is not allowed to carry dangerous weapons.

Those papers in this country which were pro-Hun all through the war are using plenty of big headlines on front pages to assure us the Huns will never sign. They will have signed long before these pages can reach our readers, and incidentally the vanquished can thank their lucky stars they are getting off so easily. In view of the fact that the Huns planned and began the war; of the barbarous means to which they resorted; and finally of the terms of settlement which they offered the allies in July, 1918, just before their final, fatal drive—in view of all this, they are getting off lightly. For much which they did, no punishment nor repentance can ever atone, nor indemnity repay.

Crude bluffers and insincere to the last moment, the Hun leaders made their people believe that the armistice and the peace terms, virtually accepted in advance, were at least as favorable to Germany as to the allies. Hence there were signs of neither repentance nor regret at the outcome. When the evil day could be no longer deferred, and with publication of the terms laid down by the allies, there instantly goes up a wail from all the nation; social functions, gaming, theaters, sports, all of which went over the top with the signing of the armistice, now suddenly cease, and the land goes into mourning at its "terrible fate."

The fate is in no sense "terrible," as the Hun arrogantly interpreted that word to the world, but it is severe and just. With four million of her best pro-

ductive men dead in the war; her navy and army reduced to a skeleton of their former greatness; her colonies and export trade gone; and worst of all, her true nature bared to all the world, Germany has a long, uphill road to travel. The national debt is $1,000 per man, woman, and child, of which 25 billion dollars is due as indemnities and 45 billion represent her own war debt. Inasmuch as the indemnity must be paid first, it is doubtful if the German war bonds are ever restored to any substantial value. It will be during the long period of heavy taxation that the German people will come to appreciate their crime of 1914.

As for the former war lord, he should be exiled for life, which for him will be a far worse fate than execution; and those other high offenders should receive the punishment of execution generally adjudged murderers.

The Human Albatross

THE two world events of the past month have been the delivery of the peace terms by the allies and the effort at transatlantic flight. While the signing of peace terms on a right basis is of far greater moment, the flight, by reason of its unknown as well as contemplated dangers, has stirred the red blood of nations the world around. This, too, was accentuated by reason of the rivalry between our own three fliers, and the competition between two nations.

Our own effort can be said to have been made under very fair conditions of success, with picked men from our Navy, after an initial over-sea try-out of 1,000 miles, and the perfectly worked-out assistance of destroyers spaced every 50 miles along the proposed route. That all three of our planes succeeded in making the long stretch between this continent and the Azores, the longest over-sea flight ever accomplished, is highly gratifying. If the NC-4 lands in Portugal, as at this writing seems probable, the ice may fairly be said to have been broken and the trail blazed. The full details of the log of the NC-4 will write the first chapter in the history of a great accomplishment.

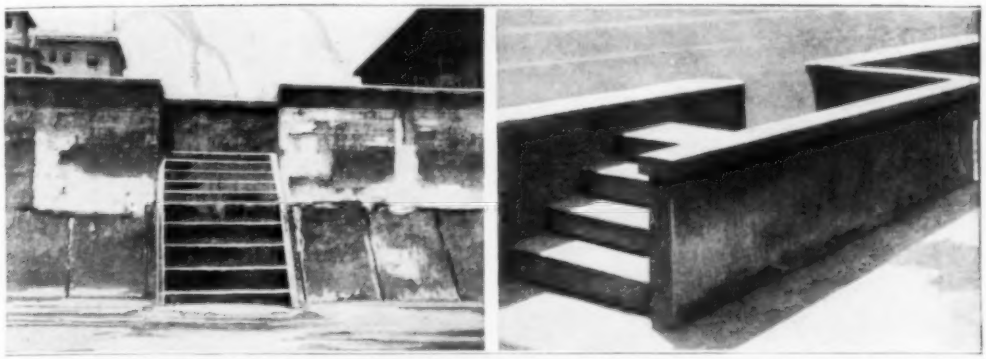
When the first trial of the steam locomotive, the steamboat, the submarine cable, the telephone, and wireless were made, the public of their day, including many learned men, united in an expectation of failure. While the dangers and obstacles of the ocean flight were realized and considered, there was a general hopefulness that the effort would succeed, for we had several years' history of sustained flights overland, while in the other experiments named they were the initial efforts.

The success of our own planes was saddened by the apparent loss of that fearless airnat, Harry Hawker, and his equally brave navigator, Mackenzie Grieve, whose courage stands out as one of the most daring efforts ever made by man. They deserved success, and the world is overjoyed that they live, possibly to try again. Hawker's anxiety that his country should achieve the lasting honor of the first unbroken flight led him to undertake the venture under such adverse conditions of weather as to make defeat seem almost inevitable. He voluntarily gave up an income of $100,000 a year, and put his loyalty to his native country before his duty to wife and child, but he carved his name among the highest in that noble company of Englishmen who for centuries have faced death with composure and a smile.

When the log is completed, I fancy ocean flight will reveal more and greater difficulties than the average layman anticipated and about what the best minds in aviation expected. Experts, of course, hoped that the trial would show the flight not to include as many contingencies as feared. It may fairly be said the difficulties, while of course not insurmountable, are sufficient, and sufficiently established, to demonstrate that regular passenger service is still a long way ahead. The weaknesses may be worked out in two or three years, which would be an amazingly short time, but the probabilities would not seem to warrant any immediate hope of regular service. Only those who have crossed the ocean can grasp the magnitude of the mechanical requirements. The final ocean plane will probably show as marked a difference from the best planes of today as an ocean steamship differs from a river steamboat of the best class. The transatlantic plane will surely come to pass, but the builders realize a lot of hard work lies between that day and this.

For the present, then, let us all rejoice in that permissible and modest pride which Commander Towers and his brave associates have so grandly won for us.

H. H. WINDSOR



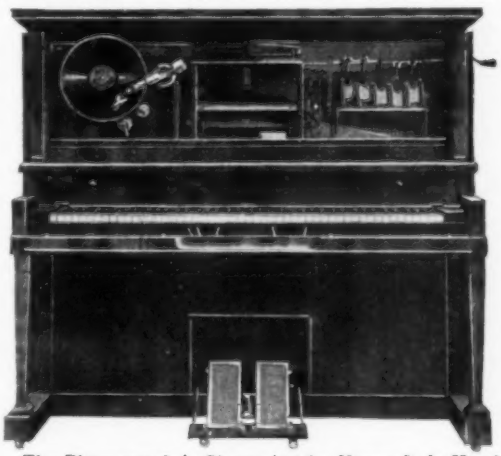
These Views Show How the Cut in the Old Sea Wall was Remodeled to Keep Out the High Tide. Instead of Walking Directly from the Sidewalk to the Beach, One Now Ascends the Small Flight of Steps at the Right before Descending. This Adaptation of the Old-Fashioned Stile Adds Three Feet to the Effective Height of the Barrier

OLD-FASHIONED STILES GIVE ACCESS TO OCEAN BEACH

To give access to the beach below, the sea wall of a coast city was once cut in many places and provided with steps to the lower level. Unfortunately, the ocean seemed to consider this an invitation, and at high tide would frequently rush through these gaps, flooding cellars right and left. Lately, however, some one seems to have recalled the old-fashioned country stile, as concrete stiles have been constructed to maintain a barrier of unbroken height to the waves. It was also considered desirable to present as flat a surface as possible to the sea, so the steps from the beach are interrupted by a landing inside the wall, from which a second flight rises at right angles to the first.

PHONOGRAPH IS TUCKED AWAY IN CASE OF PLAYER PIANO

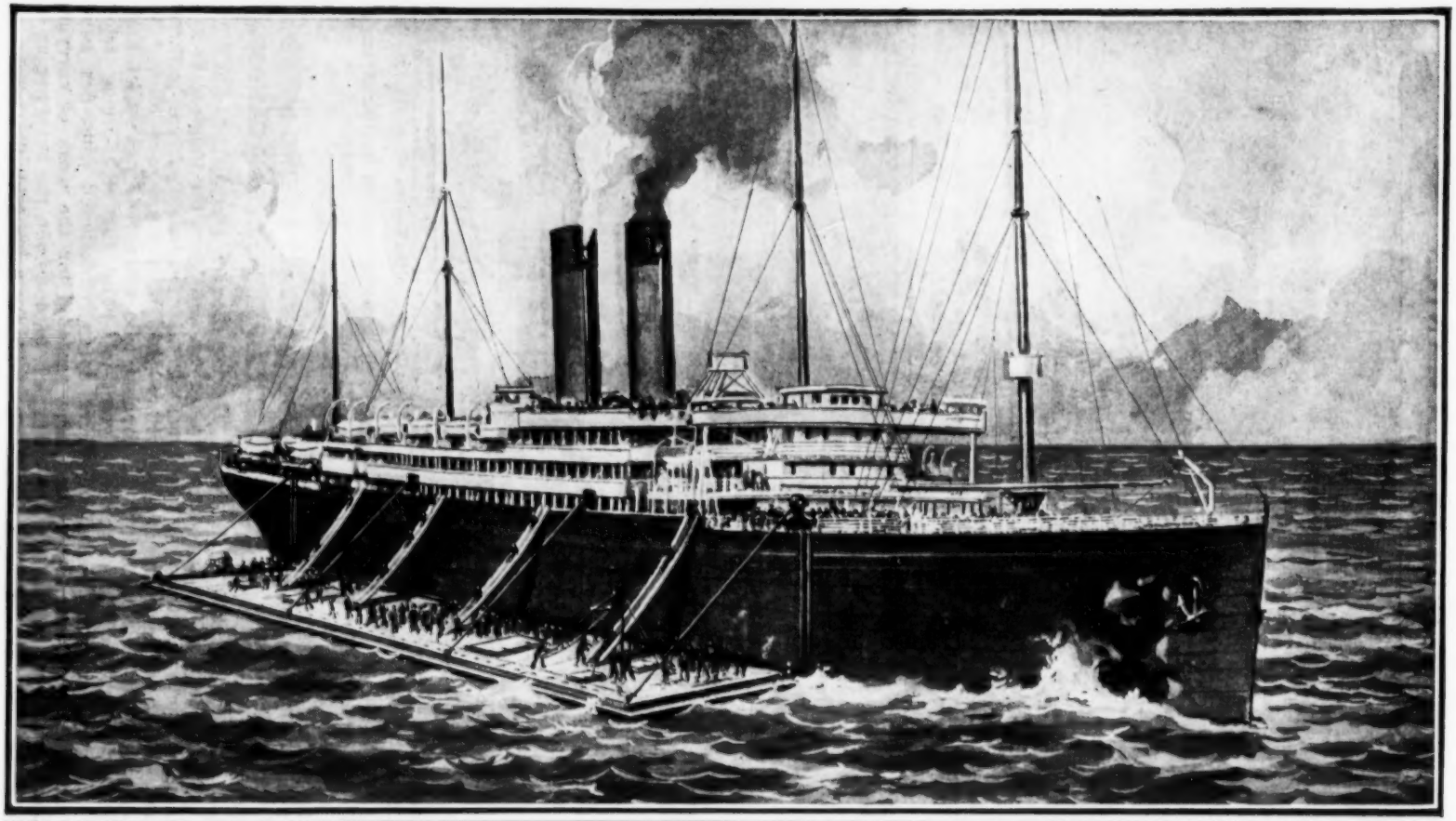
An unusual musical instrument now on the market combines the phonograph with the player piano. Only a slight change from the usual construction of the piano is necessary, as the phonograph is placed to the left of the "spool box," in space that ordinarily goes to waste. In operation, the left-hand panel of the case is swung down to reveal the turntable, set just enough out of vertical to hold the record firmly in place, with the tone arm counterbalanced to permit tracking in this odd position. As an incidental merit for the novel arrangement, it is claimed that the tone arm does not bear heavily on the record in this way, but runs lightly and smoothly along the grooves. From the arm, the sound waves are led through the horn to the amplifying chamber in the spool box. The cranking handle is placed on the upper right-hand side of the case. It will be observed that the unusual construction is made possible by the strictest regard for economy of space.



The Phonograph is Shown in the Upper Left-Hand Corner of the Player-Piano Case. The Turntable is Fixed Slightly Out of Vertical So That the Record will Not Fall Off. The Tone Arm is Counterbalanced, and the Sound is Led through the Horn to the Amplifying Chamber in the Center, above the Spool

AERIAL SIGHT-SEEING BUSSES FLY OVER WESTERN CANONS

To view the scenic wonders of the West from the air, escaping the rough trails and rocky barriers that often screen the rarest vistas—that is the prospect offered to tourists who make Salt Lake City their "going-in" point for sight-seeing trips. Five specially designed airplanes have been prepared for the work of carrying travelers to, and over, the beauty spots of the region, some hitherto inaccessible.



Both Sides of the Ship are Fitted with Rafts Like the One Shown. In Case of Disaster at Sea, Electrical Controls Lower the Rafts and Raise Their Railings. The Compartments Contain Motors, Wireless Apparatus, Food and Water Supplies, and Waterproof, Wool-Lined Suits. Belts with Rings Make It Possible to Secure the Passengers to the Raft So They cannot be Washed Overboard by High Waves. Our Artist has Shown the Device under Favorable Conditions. The Practicability of the Device Remains to be Seen. It will be Tested Out in Lake Michigan Early in July

FALSE SIDES OF SHIP FORM HUGE LIFE-SAVING RAFTS

Emergency launching of lifeboats and rafts from a ship in distress is frequently attended by confusion of serious consequence. In an effort to give absolute safety and precision to the operation of removing passengers and crew, a Chicago inventor provides enormous life rafts which normally form false sides of the ship. Each raft, of hollow, air-tight construction, may be as long as the straight portion of the vessel's sides. Socket lugs on the ship hold the lower edge of the raft below the water line, and cables bind the upper edge to the deck side. Loosing these cables allows the whole raft to fall outward to the water's surface, its buoyancy releasing it from the lower lugs. When it is afloat, hinged side walls are raised and locked in position, and the passengers transferred by means of ladders or chutes. Portholes, corresponding to those in the ship, penetrate the body of the raft, but are closed by slides after launching. Whether wood or metal is used in the construction, the body is divided by interior partitions into compartments, and provision is made for including in these one or more driving motors, a complete wireless set, and various supplies. Another feature is the storage of a supply of life-saving suits, equipped with rings whereby helpless persons can be lowered from the ship. Rafts of great length may be articulated.

TREES AS WIRELESS ANTENNÆ SERVED ARMY WELL IN WAR

How radio messages from European transmitting stations, and from ships at sea, were received by the U. S. Signal Corps by using the leaves and branches of trees as antennæ, has just been received. With this natural network, not only was reliable receiving accomplished, but transmission over short distances was successfully achieved. The only preparation made was to hang an insulated wire from a spike driven into the tree near the top, and to spread below a small wire net, the radio equipment being connected to these terminals. With nature thus assisting, the signal corps was able to establish a complete chain of these impromptu radio stations at the battle front, and their extreme convenience and invisibility gave them a peculiar value for army work.

MANY USES OF ZINC SHOWN IN BIG NEW BUILDING

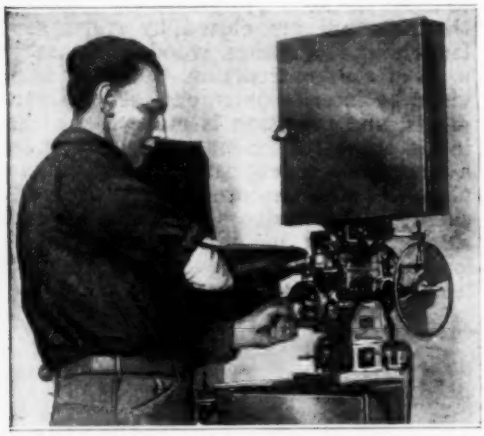
To demonstrate the structural value of the metal, an eastern concern dealing in zinc has put that commodity to remarkable uses in the construction and decoration of its big new building in New York City. Flashing, gutters, and all other outside work are of rolled zinc. Entrance and vestibule doors are sheet zinc rolled on wood, while knobs and locks are of zinc plate, and hinges are of zinc composition. Elevator walls, grilles, lighting fixtures and ornaments, low-tension electrical equipment, all are of this easily worked, noncorrosive metal. This feature extends even to the desk and office fittings, and to the constituents of paints and enamels used.

Building Erected in New York City for a Zinc Concern, in Which Practically All Exposed Metal Work, Inside and Out, Is of Zinc, Demonstrating the Value of the Metal for Such Purposes

¶ The superintendent of a South African diamond mine is using the X-ray to locate stones secreted on, or in, the persons of the native workmen. As each man passes before the powerful machine, the examiner looks through his fluoroscope, swinging it rapidly up and down, taking in the entire body in a few seconds.

ONE-ARMED SOLDIER OPERATES MOTION-PICTURE MACHINE

That the loss of the right arm below the elbow is no handicap in operating a motion-picture machine is demonstrated



Loss of His Right Forearm does Not Keep This Soldier from Operating a Motion-Picture Machine

by a crippled soldier at a hospital in Washington, D. C. The machine is motor-driven, but the operator, with an artificial forearm, finds no difficulty in threading the film and making all adjustments.

CHARGING FACILITIES PERMIT TOURING IN ELECTRICS NOW

Owners of electric autos in New York City are now able to take trips as far as Boston, Atlantic City, Philadelphia, and Washington, and return, without the haunting fear of running short of "juice." A complete system of battery-charging stations has been established along these routes at intervals which take full account of the limitations of electrics as to miles per charge. For the benefit of electric-vehicle operators, booklets have been prepared, giving the locations of these facilities and additional useful information.

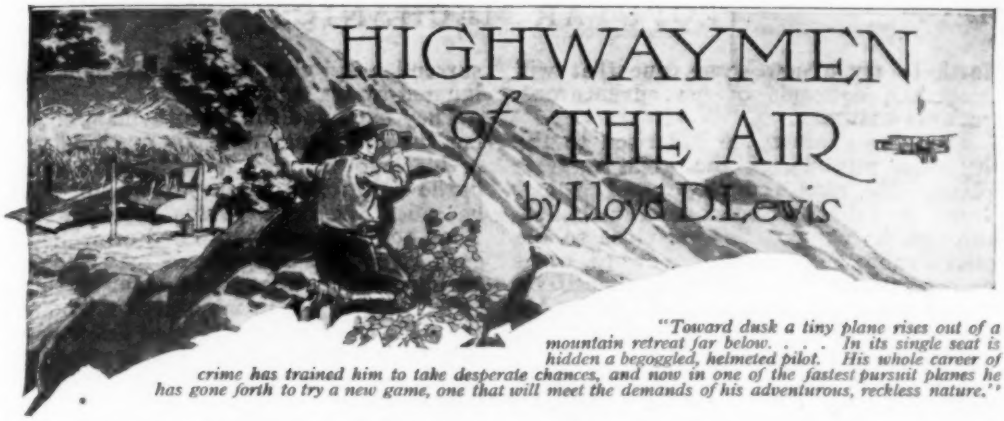
NEWFOUNDLAND'S CAPITAL CITY IS CODFISH HEADQUARTERS

The capital city of the Island of Newfoundland, St. John's, is the world's greatest codfish market. On the famous Newfoundland banks, which extend for about 300 miles southeast of the island, more than 200,000,000 lb. of cod are taken annually. Much of the catch is dried, and warehouse roofs covered with fish exposed for that purpose are a common sight. Cod-liver oil is an important by-product.

This View was Taken on the Roof of One of the Great Fisheries Warehouses of the City of St. John's, Newfoundland, and Illustrates the Manner in Which the Greater Part of the Codfish Catch is Dried Before It is Packed for Shipment

HIGHWAYMEN of THE AIR

by Lloyd D. Lewis



"Toward dusk a tiny plane rises out of a mountain retreat far below. . . . In its single seat is hidden a begoggled, helmeted pilot. His whole career of crime has trained him to take desperate chances, and now in one of the fastest pursuit planes he has gone forth to try a new game, one that will meet the demands of his adventurous, reckless nature."

GREAT BRITAIN is not a visionary, imaginative nation. In fact it is, in the prevalent opinion of the public, stolid; and yet its government has foreseen, and taken measures to forestall, the most fantastic and romantic criminal of all time—the highwayman of the air.

Unadjusted to the new world which the war made, one would be inclined as yet to consider an aerial robber as a fictitious character. The Civil Aerial Transport Committee of Great Britain does not. It regards such an eventuality as certain, and, on its recommendation, England has organized a strong airplane police force. This commitee knows that, along with giant passenger and freight airplanes and airships, will come aerial highwaymen—"knights of the road"—in greater numbers even than when Dick Turpin and his gallant masked horde enlivened the post roads of merrie England by nightly pillage of fat travelers.

Unless the world in general equips its law-enforcing bodies with the fastest airplanes and the most courageous air policemen, the influx of transcontinental "Pullman" planes will begin an era of the most picturesque crime ever known. It is not difficult to see why.

There are on the market today single-seated, high-speed airplanes that can easily make 165 miles an hour, and there is no technical expert who is not confident that a speed of 200 miles per hour will soon be attained by such light machines. These will be the vehicles of the highwaymen, for from them no passenger nor freight plane may hope to escape. Machines large enough to carry 30 or more passengers and several tons of freight have been flown, and more are being constructed. Their maximum speed under present conditions cannot exceed 100 miles per hour. Science will undoubtedly increase their speed, but when it does it will increase the speed of the smaller machine in a like ratio, for the same laws apply to both, allowing a certain rate of speed per weight, power, and resistance to the wind.

Consider the situation as it impends: The "London and Calcutta Express" rolls out of its station, rises slowly and flies eastward across Europe. It is equipped with four great engines, any two of which are capable of maintaining it at a 60-mile speed. It stands, when at rest, 15 ft. from the ground and from tip to tip it is over 100 ft. long. Within its fuselage 30 passengers are resting in club chairs, the men clustered in the smoking compartment near the rear, the women sight-seeing through the observation windows in front. In a kitchenette, porters and cooks prepare luncheon. When night comes, berths will come down from the ceiling and out of the walls.

Above the fuselage, in a glass-inclosed "wheel room," sit the pilots, mechanicians, and navigators.

In the baggage room are packages of precious freight—consignments of currency, registered mail, jewels, costly feathers, silks, all classes of valuable freight that merchants, bankers, and wealthy traders are at this moment sending to other cities on airplane transports. Speed is important in heavily financed trade, and dispatch is the chief value of aerial commerce. The passengers are rich persons, able to pay the high tax of aerial travel.

Toward dusk a tiny plane rises out of a mountain retreat far below. It is no more than 25 ft. wide, 8 ft. in height, weighs only a ton, and its fuselage is but 19 ft. long. With its one engine it travels 165 miles in an hour and climbs 10,000 ft. in a few minutes. In its single seat is hidden a begoggled, helmeted pilot. His whole career of crime has trained him to take desperate chances, and now in one of the fastest pursuit planes he has gone

forth to try a new game, one that will meet the demands of his adventurous, reckless nature.

In a few minutes he has risen to the 10,000-ft. altitude of the great express plane. He circles once around it and sends a volley of machine-gun bullets through its wings. Flirting close to the pilot's cabin he motions downward, or, if he has taken time to so equip himself, he speaks through the aerial telephone at his side, to the driver of the victim machine, ordering him to descend.

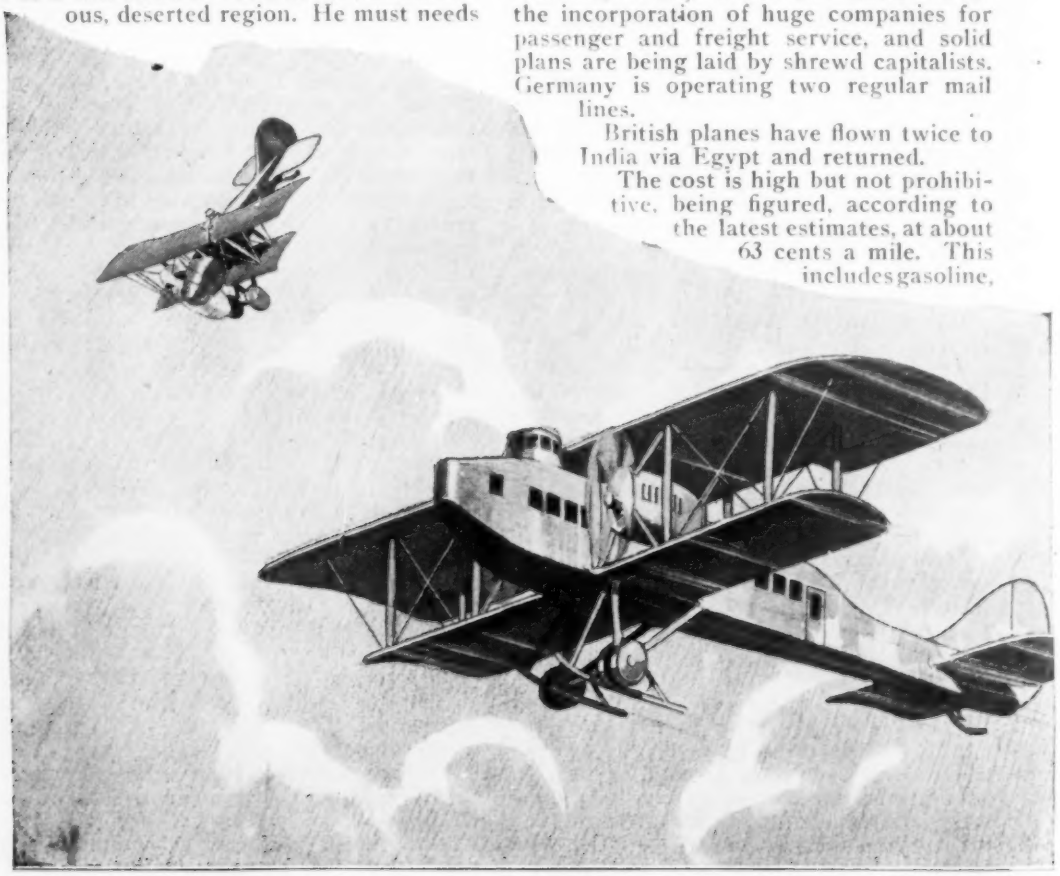
What can the pilot of the big plane do? He may decide to fight, but he knows the hopelessness of such a course, for the faster, nimbler machine can riddle him from any position, escaping return fire through superior power of "stunting." What chance has he to loop the loop or nose-dive with his bulky machine, and with 30 passengers within? He may summon aid through the wireless, but it will come too late in this mountainous, deserted region. He must needs surrender and glide down to the spot designated by his captor.

They land, and the highwayman, covering the occupants with his machine gun or his revolver, may force them to stand in the traditional manner, hands up, while he rifles them of purses and jewelry. Then he may keep them lined up while he goes through the registered mail and the freight, taking what is of value to him. Or the highwayman may, before landing, force the captured machine to accompany him to a retreat where his accomplices await, and the pillage then may be done at leisure.

It sounds fantastic, but what item of this prospectus can be refuted? Certainly, the days of transcontinental travel are here. Passenger lines are now in operation between London and Paris, traveling on regular schedule, exactly as the mail service between New York and Washington operates through the air. London, Paris, Berlin are excited over the incorporation of huge companies for passenger and freight service, and solid plans are being laid by shrewd capitalists. Germany is operating two regular mail lines.

British planes have flown twice to India via Egypt and returned.

The cost is high but not prohibitive, being figured, according to the latest estimates, at about 63 cents a mile. This includes gasoline,



"Against such behemoths of the skies our highwayman, working singly, would have small chance air craft and stranding it on some

oil, pilot's salary, mechanics' wages, overhead charges, interest on investment, and depreciation, and is for flights under 300 miles. The fare from London to Calcutta, or from Boston to Panama, for instance, could, it is estimated, be brought down to approximately 50 cents per mile, due to the economies of longer flights. Passage will be open to the wealthy and to persons to whom time means much. Money, important documents, and especially large shipments of stocks and bonds, will be transported in these flying ships in vast quantities—and all are tempting to the highwayman.

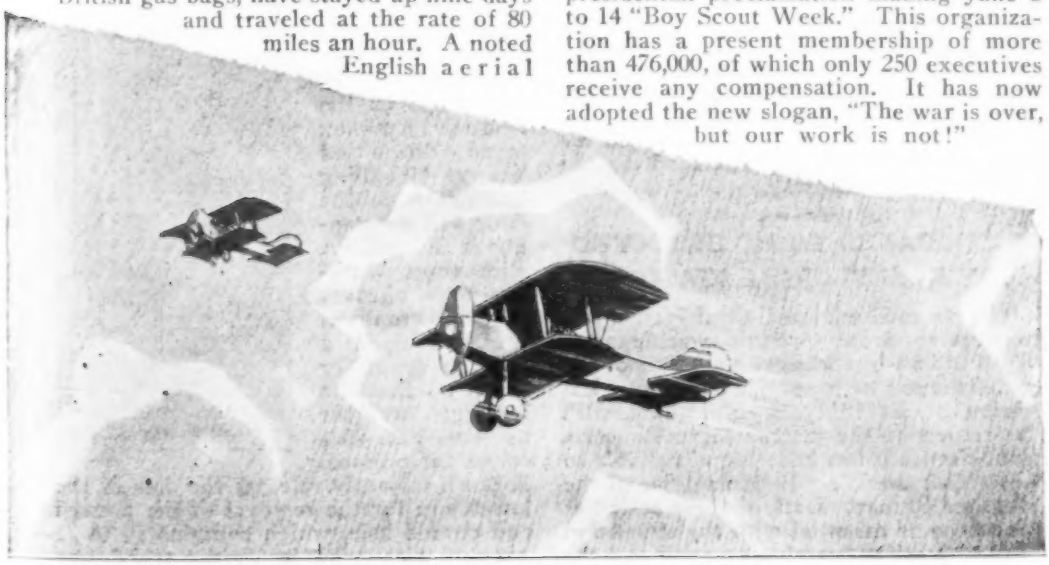
To those who may yet doubt, if such there be, it is well to quote the great Italian aerial inventor, Caproni, who says: "The day is almost here when the sky will be plowed with majestic trans-aerial liners carrying a hundred or more passengers, with sleeping cabins, dining and reading rooms, and all other desirable arrangements that go to make a long journey pleasant. Such airplanes will be of enormous dimensions and as safe and stable as the largest transatlantic liner. At present machines are built capable of carrying a score of passengers in a closed cabin. Those large air liners will be especially used for intercontinental flights. To them neither bad weather nor contrary winds will be obstacles."

The airship of the Zeppelin type will also be used on long journeys, it is believed. At present the best of them, British gas bags, have stayed up nine days and traveled at the rate of 80 miles an hour. A noted English aerial authority, and a conservative business man, states that airships of 10,000,000-cu.-ft. capacity, capable of flying 5,000 miles, of carrying 2,000 passengers or 150 tons of freight, could fly from England to America in 40 hours and make a profit of $150 on each of the passengers. The initial cost of such a leviathan of the air would be over $1,000,000, he states.

Against such behemoths of the skies, as prophesied by these two authorities, our highwayman, working singly, would have small chance of success, although he might be able to bring a dirigible down in flames with explosive bullets. What, however, is to prevent a fleet of robber planes from overtaking such an air craft and stranding it on some deserted coast or island? Morgan, the buccaneer, lived before his time.

The democracies of the world, it is safe to say, will provide ample means of protection against such catastrophes. Police planes, much on the order of those now in operation in Great Britain against smugglers and fugitives from justice, will be provided for use all over the world, and we shall see the day when the air is as fully patrolled by silver stars of authority as are the streets of our cities now, where the law-enforcing policeman takes his methodical way.

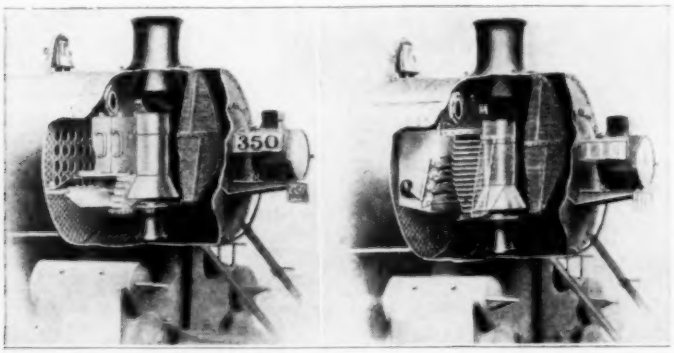
¶ The Boy Scouts of America are setting out upon a campaign for a million associate members, the drive opening with a presidential proclamation making June 8 to 14 "Boy Scout Week." This organization has a present membership of more than 476,000, of which only 250 executives receive any compensation. It has now adopted the new slogan, "The war is over, but our work is not!"



of success. . . . What, however, is to prevent a fleet of robber planes from overtaking such an deserted coast or island?"

LOCOMOTIVE SPARK ARRESTER REDUCES FIRE CLAIMS

Many states now require the use of spark arresters on locomotives, and, in any event, the considerable item of damage claims against railroads for fires set by engines calls for relief measures. An eastern railroad has equipped 500 of its locomotives with a form of spark arrester devised by its superintendent of motive power, with very satisfactory results. A slotted breaker plate with angular vanes, located between the damper and the netting of the smoke box, breaks up and deflects downward the larger sparks before they strike the latter. This netting, a screen of 3/16 by 3/4-in. mesh, is mounted in sections, for accessibility. The diaphragm table plate, under the stack, has inclined side sections attached to the sides of the smoke box, the horizontal center portion being perforated with 7/32-in. holes. This helps entrain the gases, and sifts accumulated particles to the bottom, where the draft carries them away.



The Horizontal Vanes of the Spark Arrester may be Seen Just in Front of the Damper, Which Is of the Single Type at the Left, and Multiple Type at the Right. Part of the Smoke-Box Netting Is Also Visible, and the Inclined Section of the Table Plate on the Far Side

HURRICANES TO BE DETECTED BY NEW FLORIDA STATION

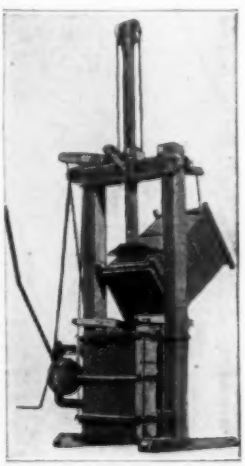
The states along the Gulf of Mexico are to receive more prompt warnings of West Indian hurricanes as a result of the establishment of a special meteorological station at Fort Myers, Fla. And with the return of the meteorological experts from France it has been found possible to reëstablish the West Indian service of the Weather Bureau. Both of these activities have become essential with the expansion of the American merchant marine and the expected growth of trade with the islands and with South America.

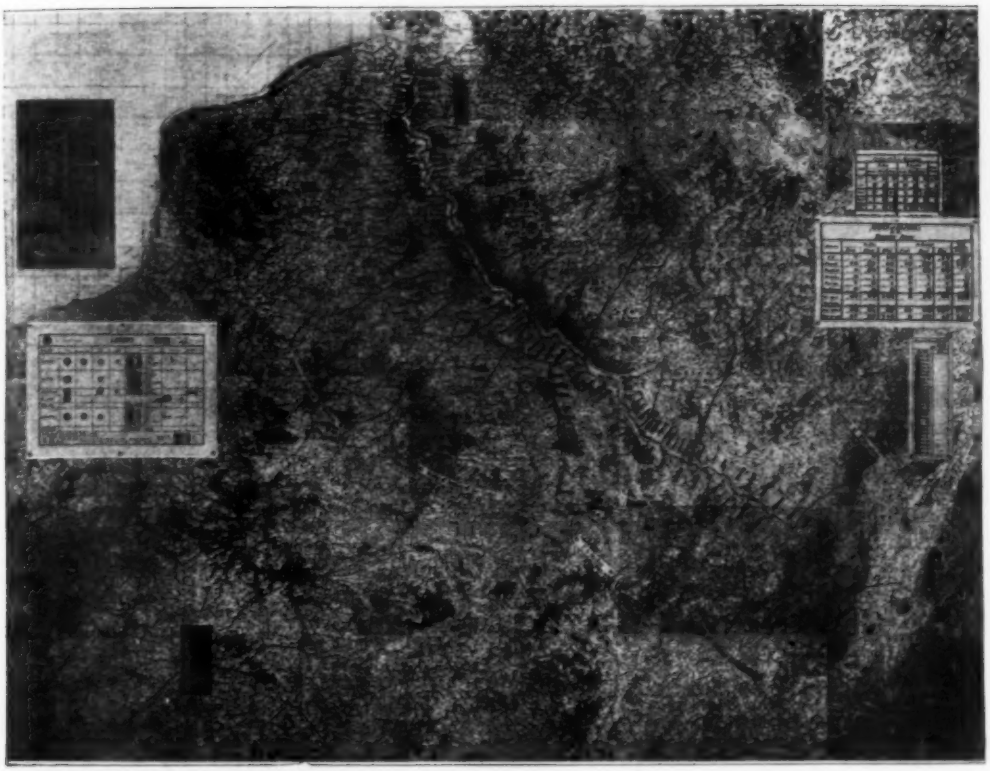
FLEXIBLE SHAFT COUPLINGS MADE OF WOVEN FABRIC

The ordinary form of universal joint has found a competitor for many of its applications, in a new flexible shaft coupling made of fabric. This device, of English origin, comprises a series of laminations of cotton cloth, between a pair of tripod spiders on the ends of the shafts. The legs of the opposite spiders are not in line, but 60° apart, so that the power is transmitted through six sectors of fabric which intervene between the spider bolts. The fabric disks are laid with their warp-thread lines at different angles, to equalize the resiliency at all points of the circle. Flexibility and elasticity are varied by using special shapes of fabric, laid straight or biased.

WOOL-BALING PRESS WORKS AS SHEEP ARE SHEARED

Some of the wool growers in Australia and in our own western states are using a wooden press which enables them to bale the wool as the sheep are sheared. The press is 5 ft. 6 in. by 4 ft. 7 in. and stands 12 ft. high; but as the receiving box turns down on hinges, all filling is done from the floor and no staging is needed. A wire rope, working over sheaves at the top, is wound upon a tapered drum, or fusee, so that the leverage increases as the bale becomes compressed. A catch instantly releases the side of the lower box for the removal of the pressed and corded bale, which contains 50 to 75 per cent more wool in a given space than with the former method of trampling it into bags.





BY COURTESY OF THE SMITHSONIAN INSTITUTION

On This Secret Battle Map of the Western Front One of General Pershing's Trusted Aids Formerly Showed His Chief the Daily Changes in the Long Battle Line by the Use of Colored Pins and Tags. The Map may Now be Consulted at the National Museum, Where It Offers an Exact Representation of the Military Situation at the Hour of the Armistice

PERSHING'S SECRET BATTLE MAP IN NATIONAL MUSEUM

As a result of a suggestion from General Pershing himself, there is now on display in the National Museum at Washington, D. C., the great battle map that formerly hung in a closely guarded room of the American G. H. Q., at Chaumont, France. Here, during America's participation in the active fighting, a member of the general staff recorded each day the changes in the battle line, the location of every division, and the limits of every army sector. Varicolored pins and tags were used, enabling General Pershing to acquaint himself almost at a glance with conditions along the western front. As the map stands now, it represents the exact military situation at the hour of the armistice. Just as it was once of inestimable value to the military chieftains, so with the coming of peace it is considered priceless by the historians who will some day analyze and describe the last campaigns of the greatest of all wars.

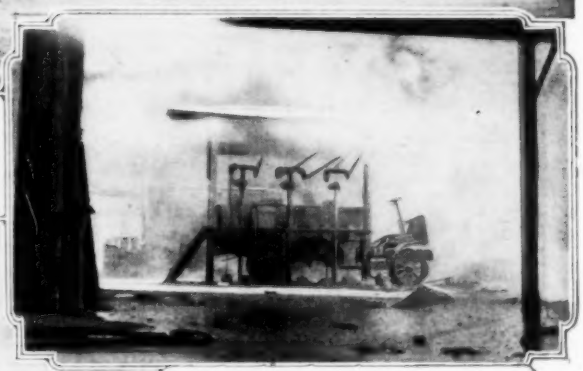
FOREIGN TAR MAKERS EMPLOY CONTINUOUS DISTILLATION

Manufacturers engaged in the distillation of tar have previously been deterred from a general use of continuously acting stills by the complicated nature of the apparatus and the practical difficulties of operation. A satisfactory apparatus of this type is now used by 130 plants in England, Australia, and Japan, however, and is consequently being carefully considered by many American producers. The new process is automatic, each product of the "fractional" process coming over in uniform quality, and the pitch being discharged without interruption. The little attention required is easily given by an unskilled workman after a day's training. The plant takes less space and costs less than the old apparatus.

¶A mock chase and "arrest" were staged by members of New York City's aerial police force during the recent aeronautical convention at Atlantic City.

BURNING OIL AND EXPLODING TANKS WORK HAVOC

The Big Oil Fire, at Phoenix, Arizona, was Just Getting under Way When This Picture was Taken, the Fire Department Opening Its Attack with the Jet Dimly Seen at the Left

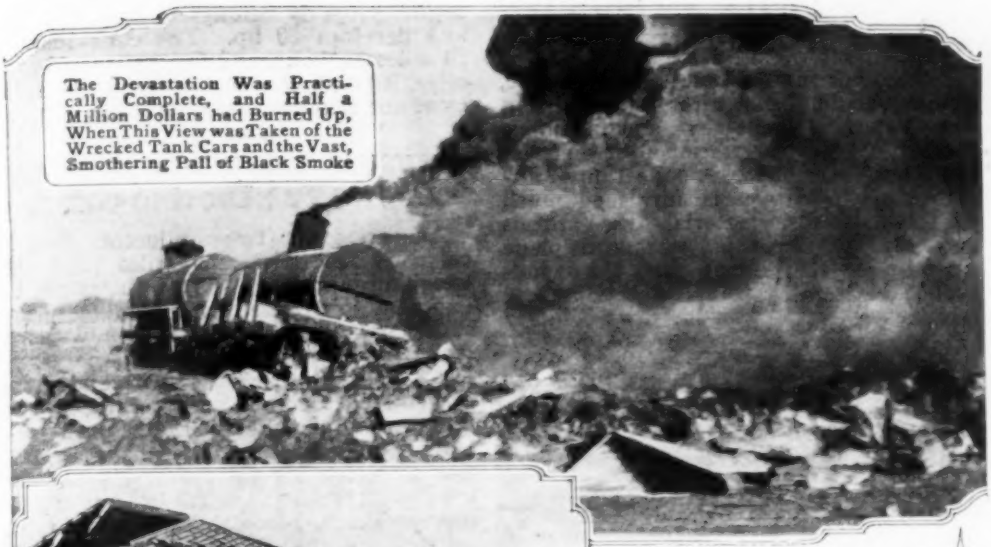


One of the Big Tank Motor Trucks was at a Filling Station When the Fire Broke Out, and had to be Abandoned to Its Fate

The Small Oil Drums in the Center of the Picture were Constantly Flying About, as the Contents of One after Another Exploded, Making Even Picture Taking Hazardous Work

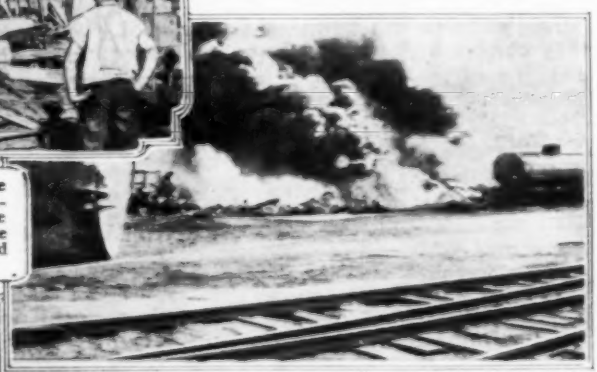
Two Minutes After This View was Taken, the Oil Plant's 20,000-Gallon Gasoline Tank Exploded, Setting Fire to the Buildings at the Right, Which the Fire Department is Here Trying to Protect

DURING HALF-MILLION-DOLLAR FIRE IN ARIZONA



The Devastation Was Practically Complete, and Half a Million Dollars had Burned Up, When This View was Taken of the Wrecked Tank Cars and the Vast, Smothering Pall of Black Smoke

When the Big Gasoline Tank Blew Up, the North Half of It Passed Clear through the Dwelling Shown to the Left. Fortunately Its Occupant Was Not at Home

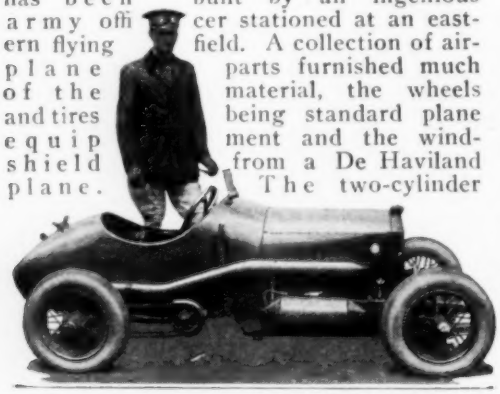


The Large Supply Tank at the Extreme Right Remained Unaffected, Though Oil Barrels were Exploding All around It, and the Flames under the Smoke Consumed Everything Combustible

This Is the Half of the Big Gasoline Tank That Went South, Damaging an Automobile and Burning Off Its Top. The Entire Oil Plant was Demolished by the Fire and Explosions, Which Occurred on April 18

SPEEDY LITTLE RACING CAR MADE OF AIRPLANE PARTS

A diminutive, but exceedingly active, automobile, modeled after a racing car, has been built by an ingenious army officer stationed at an eastern flying field. A collection of airplane parts furnished much of the material, the wheels and tires being standard plane equipment and the windshield from a De Haviland plane. The two-cylinder engine properly belongs to a motorcycle, and develops 20 hp. The car's limit is 70 miles an hour, and five gallons of gasoline, its tank capacity, is said to be sufficient for a considerable mileage.



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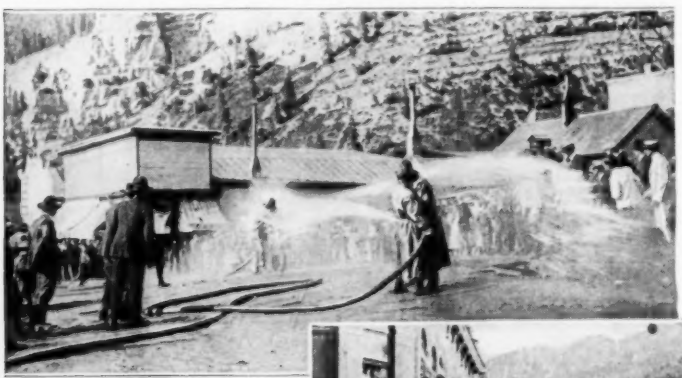
Small Racing Car with Standard Airplane Wheels and Tires and a Two-Cylinder Motorcycle Engine: The Fuel Tank Holds Five Gallons of Gasoline

UNUSUAL ONE-PIECE LENGTHS OF HEAVY ELECTRIC CABLE

An armored, two-conductor electric cable, in one piece, 30 miles long and weighing more than 413,000 lb., might be expected to present some manufacturing problems; yet such a cable is now being made by an eastern firm for the U. S. Coast Guard. After the two conductors are twisted together with paraffined jute fillers, armored with No. 6 galvanized iron, and coated with jute and asphalt, the outside diameter is a little over 1½ in. An even greater length is required in a single-conductor, 1-in. cable of similar type, ordered by the Philippine government, which is being made in four 50-mile lengths, weighing 210,000 lb. each.

TOWN FEATURES WATER FIGHT ON JULY FOURTH

In the mountain town of Ouray, Col., they celebrate Fourth of July with water instead of fireworks. "Scrub" teams, of opposing volunteers arm themselves with fire hose of regulation size, and bombard each other with torrents of icy water, forced from the city hydrants at 140-lb. pressure. The team which finally abandons its hose nozzle and takes to flight acknowledges defeat, and the successful contestants shout a loud "Ouray!" Sometimes it takes over an hour to reach a decision.

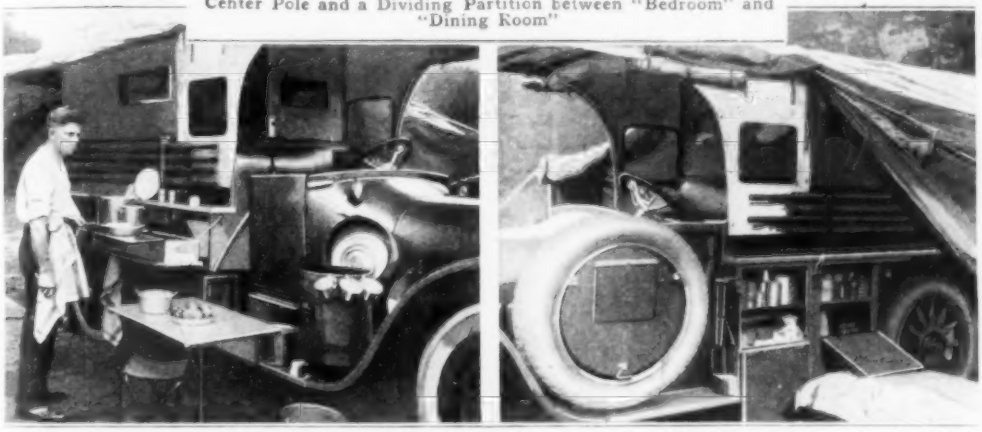


Regulation Fire Hose and Nozzles are Used in the Water Battles with Which This Mountain Town Celebrates July Fourth

¶ Despite the reported unrest in Egypt, encouraging business stability is indicated by a recent request for more American automobiles, for which payment is promised on the day the shipment leaves the factory.

The Innocent Bystanders Are in Their Usual Positions of Danger as the Water Flies in Furious Combat, but No Casualties Result, or Colds Either

The Waterproof Tent, Normally Folded on Top of the Car, is Seen Here Spread to Its Full 20 Feet, with the Car Body for a Center Pole and a Dividing Partition between "Bedroom" and "Dining Room"



The "Kitchen" is Seen in the Left View, with the Four-Burner Gasoline Stove in Operation. Folding Table and Stool and Plenty of Utensils Add to "Cookie's" Comfort. Convenient Storage Closets for Food and Medical Supplies Are Apparent above the Running Board at the Right

LIVING QUARTERS FOR FIVE IN AUTO FOR FIELD WORK

A remarkable automobile, providing living quarters in almost every sense of the word for a party of five, has been presented to the American Committee for Devastated France by a Rhode Island man. The body is built like a rear-door bus. A waterproof tent, folded on top of the car, spreads out to 20 by 14 ft., and needs no guy ropes. Four cots, bedding, five stools, and personal effects are carried on a two-wheel trailer. One sleeps in the car, his bedding being stored under a long seat at one side. A folding table takes care of "mess." Pantry and medical cabinets occupy one running board, with supplies packed in dust-proof tins and bags. On the other running board are a folding four-burner gasoline stove and the tinware cupboard. Special fixtures accommodate tools and utensils of various kinds.

LOOSE BALLS IN SPARK PLUG KEEP CARBON AWAY

Of the making of spark plugs there will be no end so long as each new model can lay claim to some feature of actual improvement. One that cleans itself of carbon, invented by an Ohio man, has a series of rough-surfaced balls lying in the annular chamber between the metal sleeve and the porcelain bushing. Supported by flanges on sleeve and bushing, these balls are kept in more or less constant motion by the explosions and vibration of the engine, thus cutting away the carbon as fast as it is formed.

ELECTRIC SIREN REPLACES ARMY BUGLE

In a government military construction center in the West the great number of workmen employed has resulted in a

Shrieks from This Electrically Driven Siren Whistle Call Soldier-Mechanics to Their Work in the Shops at a Government Aviation Field

gradual discarding of several traditional army practices. The substitution of the siren for the bugle is typical. The siren in the illustration, driven by a 2½-hp. motor, is used at an aviation field to call the men to work in the morning and afternoon, when its shrieks can be heard for miles about the countryside.

TWO UNCOMBINING SUBSTANCES FOUND IN PROTOPLASM

During the last 60 years the biologists have devoted much time to the study of protoplasm, the grayish, semifluid matter held to be the physical basis for all animal and vegetable life. They have learned much, but much remains a mystery. Interest is consequently aroused by the announcement from a prominent biologist that the all-important substance is chiefly formed of two components which do not unite chemically, but mix with each other in finely divided form. This same scientist may be remembered as the experimenter who hastened nature's slow process of evolution by injections into the ovaries of certain plants. Using, among other agents, a weak solution of stimulating mineral salts, he is said to have charged the cells before fertilization so that the new life later developed from the cells so treated appeared as a different form of species.

AIR-OPERATED CONTROL FOR WATER-TANK FEED

To control automatically the supply of water pumped to a storage tank, as commonly used at country places, an English system depends upon air pressure to close the motor switch. On the supply pipe at the pump is an air chamber, equipped with a special switch. The closed storage tank has a small air vent. A full head of water in the tank maintains sufficient pressure in the air chamber to keep the switch open. At a certain low point, however, pressure is so reduced that the switch closes and the pump starts. A relay is used in heavy installations.

HANDLES OF "MEDICAL COIL" CARRY WHOLE EQUIPMENT

A common flash-light dry battery in its tubular metal case forms one handle of a novel form of "medical coil," or electrotherapeutic set, now on the market. A similar metal tube, forming the other handle, contains the induction coil with its interrupter. The instrument is completed by the flexible cord that connects the two parts. A socket in the battery handle receives the stem of a sponge applicator if desired, and a switch is provided to divert the current from the tube to the sponge.

The Two Left-Hand Views Show How Battery and Coil are Contained in Two Handles. The Set is Seen in Use at the Right, with Sponge Applicator Attached

A core tube sliding in the coil regulates the current strength.

THE PERISCOPE BECOMES AN EVERYDAY UTILITY

There need Be No Thought of War When Anyone Says "Periscope" Nowadays. Here Is a Trolley-Car Motorman Looking through One, Conveniently Mounted on the Front Platform, to See if All the Passengers Are On

For Watching a Baseball Game without Paying Admission, These Boys Find a Trench Periscope Better than a Knot Hole; and Besides, It Has an Excitement All Its Own

Submarines Are No Longer the Only Kind of Boats Armed with Periscopes, for This Motorboat Owner Finds His Very Useful While Steering in a Narrow Stream or Crowded Harbor

This Railroad-Crossing Flagman need Not Even Step Out of His Door to Keep Track of the Trains That Pass, Because the Periscope, Projecting from His Window, Gives Him a Full View of the Road

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SILO BLOCKS OF CONCRETE MAKE GOOD BRIDGE ARCH

Because concrete silo blocks are curved, it occurred to a rural contractor in Michigan that they should make excellent arch units for small bridges. The application of this idea proved both practical and artistic. After building up the arch ring with the blocks, side walls are cast in monolithic concrete, and posts and rails erected of the same material. For making the curved blocks, he uses a machine of his own design, in which the sides of the mold are operated by a treadle.

That a Bridge Made of Concrete Silo Blocks Is Artistic as Well as Substantial is Revealed by This Picture of Such a Structure in Michigan. The Posts and Rails Are Also of Concrete

PORTABLE GENERATING PLANT DRIVES STUMP DRILLS

A portable generating plant of recent design has been used to excellent advantage by a Georgia concern for operating drills with which old stumps in turpentine fields are bored for dynamite charges. The plant is driven by an internal-combustion engine, the whole equipment being mounted on a wagon so that it can be drawn about, as desired. It is a 4-kw., 60 to 100-volt outfit, and supplies power for two large drills.

Portable Generating Plant Used in Georgia Fields to Bore Stumps for Dynamite Charges: With These Power-Driven Drills the Men Do Many Times the Work They can by Hand

SIGNS MAKE MOTORING EASY ON TRUNK HIGHWAYS

Wisconsin's 5,000-mile trunk highway system, reaching nearly every important city and village, is marked so thoroughly that strangers often motor from one end of the state to the other without making a single inquiry about roads or directions. Incidentally the new system appeared quite dramatically, not long ago, when the old inadequate signs were replaced by the new standardized markings during a single week. The success of the system is attributed to the rather unusual idea of giving an official number to each of the 68 routes throughout the state, as, for example, on Route No. 10, which connects Beloit, Madison, and Duluth, the numbered sign appears at intervals en route, and on connecting streets in cities and villages. In this way, knowing the number of the route he is to take, the tourist simply follows his number to his destination. Despite its present efficiency, however, additions to the system are contemplated. Other signs will give directions and distances to all important cities in or near the state; wooden "milestones" will enable a traveler to report definitely a bad stretch of road; boards at the boundaries of each patrol section will announce the name and address of the responsible patrolmen, and at the county lines, the name and address of the county commissioner.

¶ Possibility of a German trade revival to anything like prewar magnitude recently received another setback when the American government purchased outright the piers of the old Hamburg-American line at Hoboken, New Jersey.

This Is a Bit of the "Campus" of the American Army University at Beaune, France, Showing a Few of the Many Substantial Tile-and-Concrete Classrooms

The German Locomotive Seen at the Left, and the American Model at the Right are Now being Used by Students at the American Army University in France

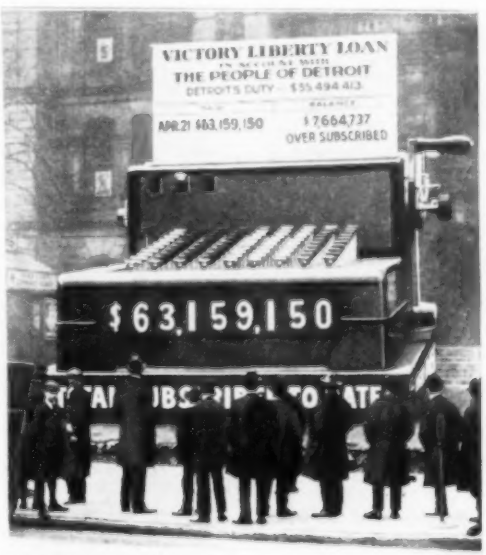
AMERICAN ARMY UNIVERSITY BUILT ON USUAL BIG SCALE

The American Army University at Beaune, France, another of the A. E. F.'s large-scale achievements, was mentioned in Popular Mechanics Magazine for May, 1919, as the most striking feature of the army's educational program. Recent material additions have again made it worthy of comment. To the buildings of the old American base hospital have now been added row after row of barracks, mess halls, recitation rooms, laboratories, work rooms, and offices. A model bakery turns out big "homemade" loaves of bread for the student-soldiers; a model laundry keeps their clothes clean. Throughout the square mile covered by the school have gone macadamized roads, wires for electric light and telephone communication, and railroad switches from the main line to the many machine shops. The whole big task has been done with the quiet thoroughness which the folks in America have come to expect of their army in France.

¶A coal yard with a storage capacity of 30,000 tons, intended for various Federal departments and buildings, is now operated by the government in the city of Washington.

LOAN TOTALS REGISTERED ON BIG ADDING MACHINE

One of the cleverest of the many schemes used to advertise the Victory Liberty loan was the monster adding machine which rested in front of Detroit's city hall during the campaign. Thousands gathered each day to see the 24-hours' balance appear on the 10½-ft. ledger page, while the dials in front of the machine registered the total subscription. The machine was made chiefly of wood, and measured 34 by 22 ft. in plan, with a height of 30½ feet. Four searchlights provided illumination at night.



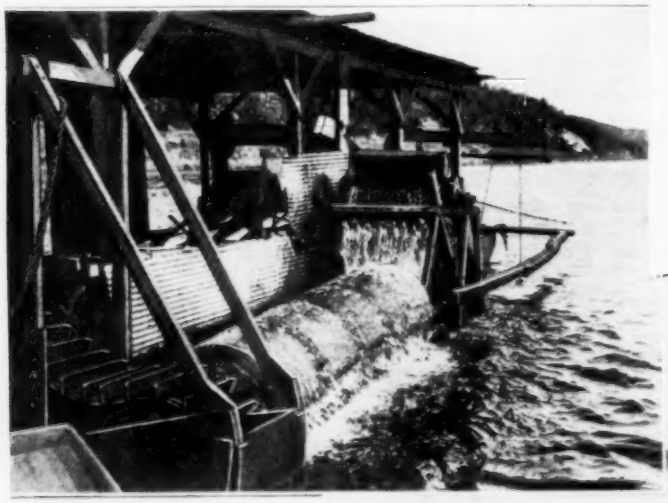
This Mammoth Adding Machine Announced Each Day Detroit's Total Subscription to the Victory Liberty Loan. The Ledger Page Itself Is More Than 10 Feet High

SMALL, LIGHT HAND LOOM IS BOON TO INVALIDS

Invalids Find Pleasant Occupation with This Small Hand Loom. The Warp Threads are Kept Taut by being Stretched from a Bedpost to the User's Waist

Weaving, oldest of useful arts, commends itself to the inexperienced for the simplicity of its processes. A hand loom so small that it may be carried in a hand bag, yet capable of weaving excellent belts, bags, cravats, trimmings, etc., is now in use at an eastern sanitarium, where patients unable to leave their beds can readily use it. The heddle is 7½ in. high and 5¾ in. wide, and the shuttle 6 in. long. One end of the warp threads is fastened to a bedpost or other fixture, the opposite end being tied around the user's waist, and thus easily kept taut. Alternate warp threads are passed through eyes in the needle in the usual manner. A wood roller at the weaver's end gathers the woven fabric.

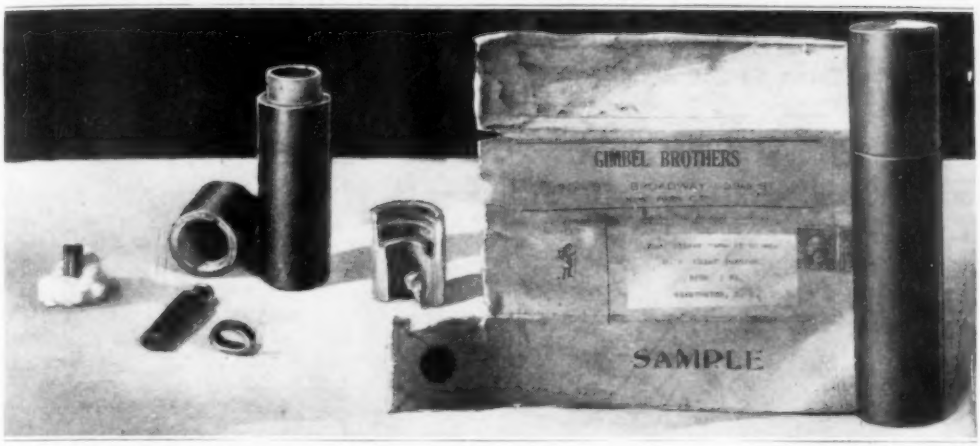
COAL PUMPED FROM RIVER IN FORM OF PEBBLES



Sifting Drum on the Dredge Boat, Which Receives the River Coal from the Pump and Separates It from the Mud, Sand, and Stones

Coal in the form of smooth, rounded pebbles has been discovered in large deposits in the bed of the Susquehanna River, where it flows along the base of Montour Ridge in Pennsylvania. Hydraulic dredges are being used for the operation of mining it, the buckets bringing up the little carbon lumps free from dust, of course, but mixed with mud, rocks, and sand. The conglomerate is automatically dumped into a sifting drum, which segregates and rejects these impurities. The coal, of very good quality, is then shoveled onto barges which lie alongside the dredge boats. The cleanliness of this form of mining is a feature that appeals to the workers, contrasting strongly with other operations in the state.

This Load of Coal, Which has Just been Dumped into the Barge, Gives an Idea of the Form This Curious River Product Takes. It Is Like a Mass of Rounded Pebbles, and, of Course, Quite Clean



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Exposed at the Left Are the Contents and Parts of One of the "May-Day" Bombs, Mailed in New York under the Counterfeit Wrapper Reproduced at the Right, but Stopped by the Vigilance of Postal Authorities

SEIZURE OF BOMBS IN MAIL FOILS ANARCHIST PLOT

Discovery by postal authorities of a large number of dangerous bombs, which had been mailed in New York during the last days of April, undoubtedly saved the lives of many prominent men. Cabinet members, federal jurists, and other national figures were included in the list to which the parcels of destruction were addressed. The bombs were all alike, each consisting of a cylindrical wooden box 7½ in. high, containing a stick of dynamite, a ¼-oz. bottle of explosive fluid, and three fulminating caps wadded in cotton. Every wrapper bore an address label counterfeiting one used by a large New York store. Though a few escaped the post-office searchers, only one did any harm, injuring two women who essayed to open it.

ESCAPED LIONESS DRIVES TOWNSPEOPLE TO CELLARS

When the circus lioness broke from her cage at Woodbury, N. J., recently, the residents of that little town were just as scared as could possibly be. The trouble started through the carelessness of a colored keeper who entered the cage without locking the door, and stooped to fondle the mother's cubs. Rushing upon him from another compartment, the resentful lioness seized his neck and crushed it with a snap of her jaws. Panic followed, while attendants beat the animal in efforts to induce her to release the mangled corpse. Breaking through the unlatched door, she streaked out of the tent and into a near-by wood. Those inhabitants of the town who were not enjoying the protection of their cellars, then joined forces with the circus crew and were able to kill the beast after firing over 100 shots.

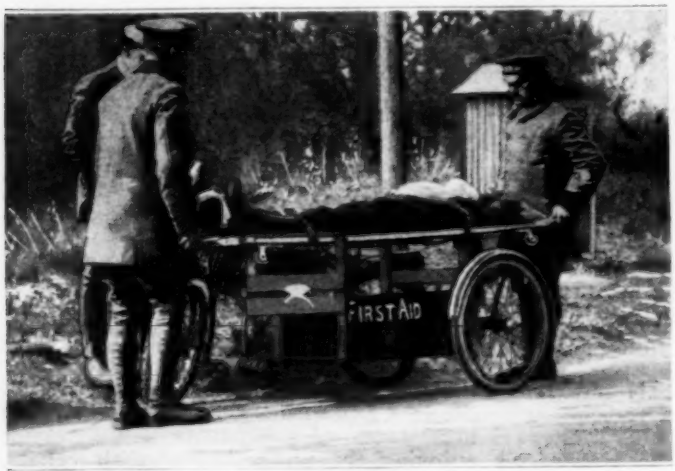
SHIELDS FIRE RANGER'S EYES FROM MOUNTAIN GLARE

Among the discomforts to which fire rangers of the national forests are inured is the glare of the sun on high peaks. In the interest of better vision, however, one of them has devised a shield in the form of a box fitting over the eyes, provided with an observation slit in front. Ridges in the blackened interior cut off all rays not needed. The shield also protects the eyes from the high winds.

¶ In the mud bottom of a lake in Sweden a "tin hat" has been discovered which, archeologists declare, is some 600 years old and represents a type worn by the vikings. It resembles those used by the American army, but the visor weighs over four pounds.

STRETCHERS ON MOTORCYCLES FOR INJURED AUTOISTS

Already famous for its establishment of roadside conveniences, an English automobile association now has added a first-aid service. A telephone call from any of its frequent wayside stations brings, if needed, a motorcycle with a stretcher-bearing sidecar, equipped for any emergency, from carrying a casualty to repairing a wrecked car.



Motorcycle with Stretcher Sidecar, Used by an Auto Association in England for Giving First Aid to Distressed Members: In the Background Is One of the Association's Frequent Wayside Telephone Stations

MARSHAL FOCH DONE IN SOAP FOR WINDOW DISPLAY

To draw the eyes of the crowd to his window display of castile soap, a shopkeeper secured a bar of the same material, measuring 18 by 24 in. He placed it in the hands of a sculptor, who carved upon it, in bas-relief, a faithful portrait of Marshal Foch.

¶ More than 8,000 American-made tractors were shipped into Canada during the months of December, 1918, and January, 1919, to the despair of Dominion tractor makers who are calling for a prohibitive import duty.

COLLEGE COURSES IN COAST ARTILLERY TO BE REVISED

During the world war, the Coast Artillery of the United States Army furnished officers and enlisted men, not only for the coast defenses of this country, but for the railway and other heavy guns, for the anti-aircraft, and even for part of the trench artillery. And in consequence of these enlarged and varied functions, the training of Coast Artillery reserve officers in American colleges and universities will henceforth be considerably broadened and varied. It is hoped to increase the number under instruction each year to 1,500 students. During the school term these men will be instructed by army officers in general military science for two hours each week. But during the six weeks at the summer camps the training will be altogether military, embracing a broad grounding in artillery methods, and practical, specialized work in anti-aircraft and heavy, mobile artillery, and in artillery of position. Five schools have already accepted the establishment of such instruction units, while proposals from 14 other universities and colleges are under consideration by the war department.

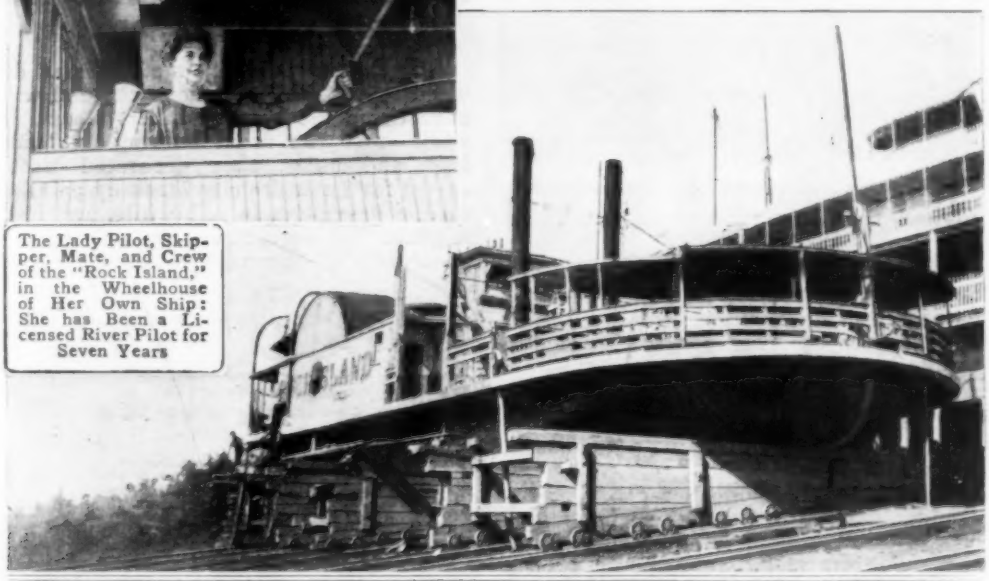
WASTE PARAFFIN AND PAPER SALVAGED BY NEW PROCESS

As a result of recent experiments, a U. S. Forest Products Laboratory is able to describe a method for recovering a large part of the eight or 10 tons of material wasted daily by manufacturers of paraffined paper and the familiar cartons and cups. The waste material, consisting of paper impregnated with paraffin, is finely shredded, and treated with a petroleum-oil solvent. Carried off in the solvent, the paraffin and oil are then separated and both are used again. In addition, the solvent clinging to the paper pulp is recovered by a steaming process, and the pulp itself made once more into paper said to be fully as strong as the original.

WOMAN RIVER PILOT IS CAPTAIN, MATE, AND CREW

Here Is the Good Ship "Rock Island," the Only Passenger Steamer Owned and Piloted on the Difficult Waterways of the Mississippi Valley by a Woman. As It is Seen Here, It has Just been Launched at Mound City, Illinois, on the Ohio River Just above Its Mouth

The Lady Pilot, Skipper, Mate, and Crew of the "Rock Island," in the Wheelhouse of Her Own Ship: She has Been a Licensed River Pilot for Seven Years



The "Rock Island" on the Ways, Just Before Its Launching at Mound City, Which Operation the Owner Superintended: The Picture Shows the Method Used in Launching River Steamers, down in "Egypt," Illinois

A striking example of woman's adaptability to strange professions is the success of a feminine pilot whose boats ply the waters of the Mississippi Valley. Not only is she adept in threading the fickle channels romanticized by Mark Twain, but her trading ventures seldom result to her disadvantage. A middle-aged, unassuming woman, it is her practice to buy a boat, select a promising community on the Father of Waters or one of his big tributaries, establish an active ferry traffic, and then sell out, only to repeat the cycle of operations elsewhere. Her personal supervision during the overhauling of a boat is assurance that the work will be thorough and rapid. On the rivers for 16 years, she has been a licensed pilot for seven; and the only man on her boat is the engineer.

STEEL TERRACING MACHINE PREVENTS SOIL EROSION

Erosion of farm soil, with its costly waste, can be prevented by proper terracing and ditching. A late development in machines for this work consists of a steel cutting blade, 5 ft. long and 14 to 17 in. wide, with both upper and lower edges flanged and sharpened, and hinged to work at any angle. In grading, it will shed dirt at 60°, and in ditching, at 30

to 45°. The steel landside, ⅜ in. thick, 10 in. wide, and 9½ ft. long, has tempered-steel guide fins to prevent skidding. A rolling colter cuts the turf in front

This Terracing Machine, Useful as Well for Ditching and Grading, Is All Steel and Cuts without Clogging or Skidding. To Haul without Cutting, It is Turned Up on Its Landside

and helps keep the machine in line. The implement weighs 365 lb. and accommodates two men on its steel running board. Four horses are used for the maximum results.

MODEL TENEMENTS TO REPLACE CONGESTED CITY SLUMS

Despite the Londoner's reputed prejudice against life in the "tenement" buildings so well known in American cities, much interest has been aroused by the plans of a public-spirited duchess for several structures of this sort to be erected in one of the most congested sections of the metropolis. She would fit them with bathrooms and hot water on every floor, conveniences most unusual in the great slum districts, yet not half as rare as the playground she would provide for the roof, the baby-carriage "garage" in the basement, and the central laundry with mechanical driers, located on one of the lower floors.

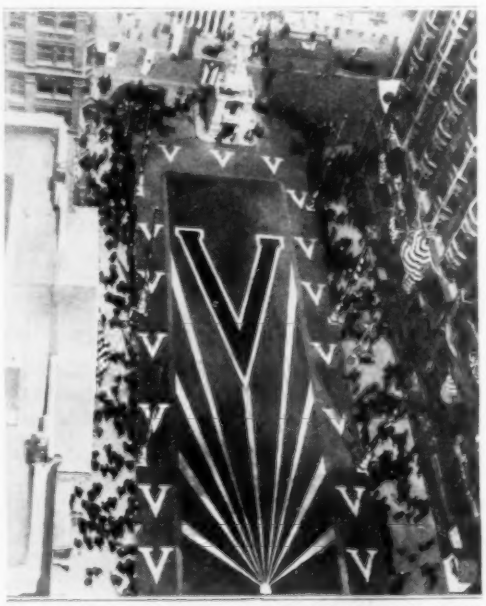
¶Purifying the water in more than 400 wells in France's invaded territory is the gigantic task undertaken by the ministry of the liberated regions. It is expected the work will be finished before the summer is over.

FLYING BOAT HITS LOCK OF PANAMA CANAL

An accident of rather unusual nature recently cost two lives at Miraflores Lock on the Panama Canal. Two officers were in a flying boat piloted by a third. Engine trouble suddenly forced the pilot to try a landing in the waters of the canal just beyond the lock. Unfortunately, however, he was already too low; and barely clearing the first gate of the lock chamber, the plane struck the second, throwing the three men into the water. Only the pilot escaped with his life.

PAVEMENT BECOMES BILLBOARD FOR LOAN CAMPAIGN

An unusual publicity medium was devised by the Philadelphians charged with advertising the Victory Liberty loan. In addition to the usual bunting on buildings and poles, they decorated Broad Street for an entire city block by painting on the pavement, in red, white, and blue, a great "V" surrounded by a border of smaller "V's." Perhaps this is only a fore-



COURTESY EVENING PUBLIC LEDGER

This Block of Painted Pavement Shows How Philadelphia Campaigners for the Victory Liberty Loan "Painted the Town" in a Good Cause

cast of the day when a business man first constructs a horizontal billboard to catch the eye of the airplane commuter.

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Members of an English Society for Preserving Angling in the River Thames are Seen at the Left Carrying Perch, Roach, and Other Species of Fish to the River, to Restock It for Future Fishing. At the Right the Small Fish, Just Caught at Hampton Waterworks, are being Transferred to the Carrying Tank

ENGLAND'S RIVER THAMES RESTOCKED WITH FISH

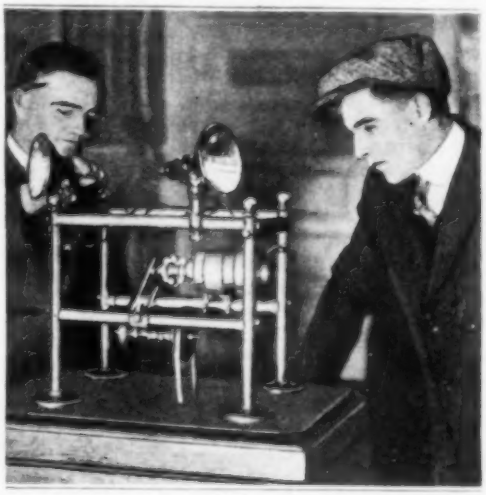
Restocking lakes and streams with fish for the benefit of anglers is not wholly peculiar to America. A society whose purpose is the preservation of the gentle art along the River Thames, in Izaac Walton's own land, places thousands of young fish in the stream every year. Perch, roach, and other species of the locality are captured with nets at waterworks and reservoirs, and transferred in huge cans to the river.

MOTORCYCLE WINDSHIELD ADDS TO SPEED AND COMFORT

In addition to protecting the motorcyclist from the usual chilling wind pressure, a thin sheet-metal windshield has been found to add ten miles an hour to the speed of the machine. The decreased wind resistance is also reported to result in an increased fuel mileage of from 10 to 15 miles a gallon. Light from the headlight passes through two glass-covered holes in the shield.

DEMONSTRATES AUTO DYNAMOS WITHOUT RUNNING ENGINE

To eliminate the nuisance of motor noise and gas in the display room, a Los Angeles motorcycle agent devised a method of demonstrating lighting generators for motorcycles and autos without running an engine. The lights are mounted on the top bar of a tubular frame, and the generator on a lower bar. Effects at different speeds are shown by adjusting the electric driving motor inside of the show case on which the frame rests. This simple device is credited with causing an immediate increase in sales.

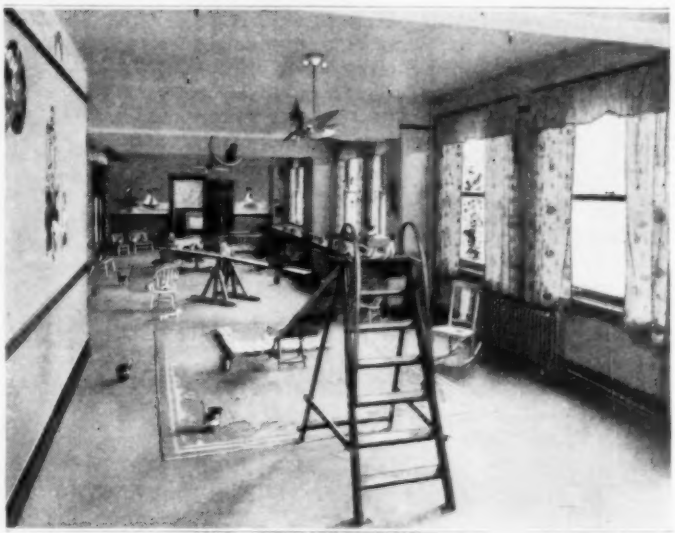


Frame of Metal Tubing Arranged to Hold on Its Bars a Lighting Generator and Several Automobile or Motorcycle Lamps: Electric-Motor Drive Makes It Unnecessary to Run an Engine in the Showroom

THEATER NURSERY ENABLES MOTHERS TO SEE SHOW

Theatergoing Mothers may Safely Leave Their Babies in These Cribs While They Watch the Performance

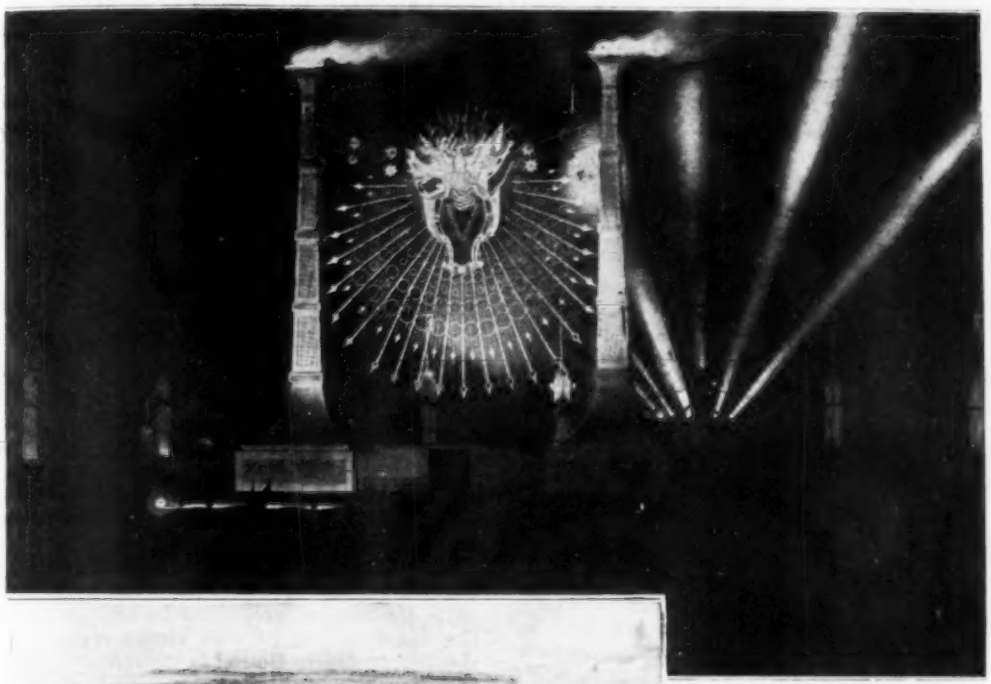
Many a mother can testify to the small baby's utter lack of appreciation for the subtleties of the drama. In fact, the baby's tendency to crow as the heroine expires, and to weep clamorously at the big joke of the evening, has resulted in a policy of rigid exclusion in most theaters. To obviate this, however, the builders of a new Chicago theater instructed their architect to include a real children's room in his plans. So he provided two big rooms which occupy almost the whole of the third-floor front, between the gallery promenade and the street. And mothers' kiddies can now sleep in a dainty nursery, or romp in the cheerful, airy playroom which contains every one of the nonbreakable joy-makers dear to childish hearts. They are all there, merry-go-round, seesaw, shoot-the-chutes, and a regular army of woolly dogs and friendly dolls. The decorative scheme is of the conventional type, with gayly colored curtains and painted walls, on which appear the immortal characters of nursery lore.



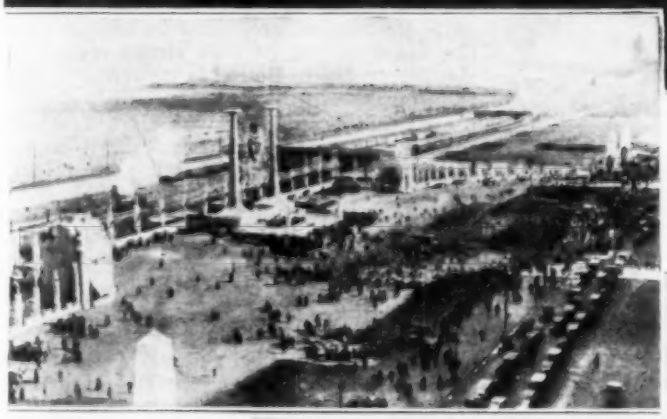
Conveniently Located Just off the Gallery Promenade Is This Theater Playroom Which Keeps the Children Busy While Father and Mother See the Show. The Nursery for the Littlest Tots may be Seen through the Open Door at the End of the Room

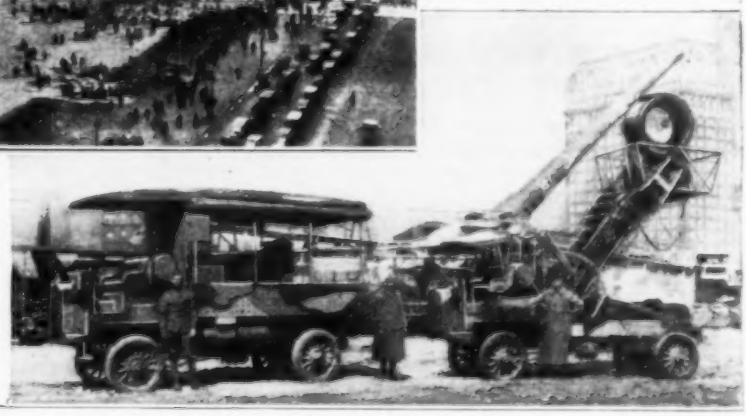
ALTAR OF VICTORY FEATURES LOAN CAMPAIGN

During the Victory-loan campaign, Chicago's famous downtown lake-front boulevard was transformed by an unusual decorative treatment. Thirteen continuous blocks were christened the "Victory Way," and decked with flags, ferns, colored lights, and statues, while huge illuminated obelisks marked every street intersection. Midway stood the open-air auditorium, or Victory Forum, in which great audiences assembled to view the displays of war material and listen to music and speeches. Forming the background for the platform stood the center



The Daylight View, at the Left, of Chicago's Lake Front Victory Forum Shows the Display of War Material and the Jeweled Altar of Victory. Above will be Seen in More Detail the Jewel-Studded Curtain in Its Blaze of Light, and the Two Slender Columns from Which Rose Clouds of Illuminated Steam



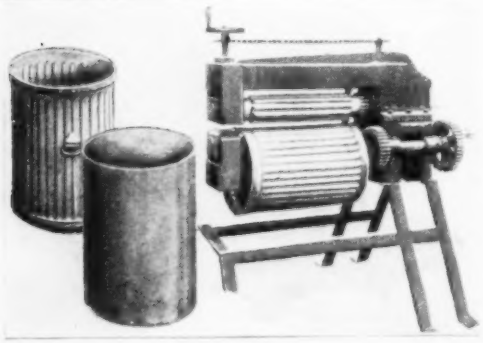


This 36-Inch Searchlight was Furnished by the Coast Artillery to Boost Chicago's Victory-Loan Campaign. The Unit Rides in Two Trucks, One Supplying the Power, the Other Bearing the Projector on a Pivoted Arm Which Permits Elevation to a Height of 22 Feet. The 12-Inch Railway Rifle Was Another Feature of the Display

of all interest, the Jeweled Altar of Victory, graceful in the sunlight, but really beautiful at night, as 30,000 colored "jewels," formerly used in the San Francisco Exposition, shattered the light from 11 monster searchlights. Four of these searchlights, by the way, were designed for the aerial defenses of Paris, but were diverted by the armistice to these more peaceful tasks. The whole altar was essentially a jewel-studded curtain, 60 by 60 ft., suspended between two slender 80-ft. columns, atop each of which were powerful colored lights which mingled their rays with jets of steam, creating a striking illusion of smoke and flame. The whole work was a bit of harmonious and well-balanced beauty.

MACHINE CORRUGATES BARREL BLANK IN THREE MINUTES

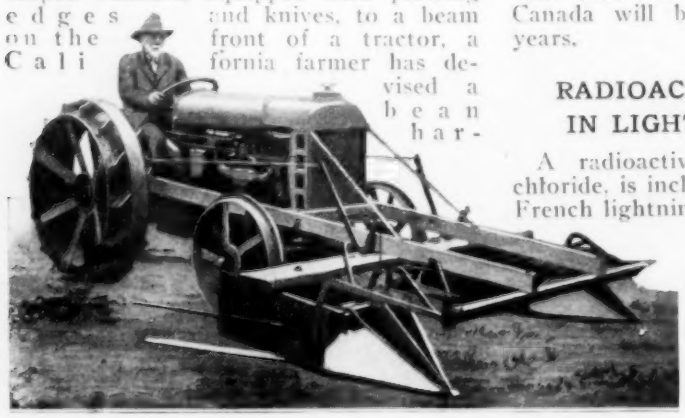
One galvanized-iron barrel can be corrugated every three minutes with a machine now on the market. In operation, the workman inserts the barrel blank, curved to the desired shape and held by a side seam, between the geared steel rollers. Starting the machine, he revolves the horizontal hand wheel which actuates two adjusting screws, bringing the upper roller into contact with the work, and thus stamping the corrugation on the blank. An advantage claimed for this method is that the lengthwise seam is pressed flat during the operation.



The Blank in the Middle is Corrugated between the Rollers of This Machine, Finally to Become the Finished Galvanized-Iron Barrel at the Left

BLADES ON TRACTOR HARVEST BEANS AND OTHER CROPS

By attaching a pair of nose-shaped runners, equipped with plowing edges and knives, to a beam on the front of a tractor, a California farmer has devised a bean harvester useful for a number of other purposes. The beam is adjustable for elevation, so that the knives may be held at the desired elevation for cutting stalks, or the plow edges may make a shallow furrow in the ground. Two runners cut four rows, but a third runner may be added if desired. The attachment cuts weeds and harvests—besides beans—peas, onions, garlic, and other crops, which it leaves in windrows.



Bean-Harvesting Attachment for Tractor, with Adjustable Cutting Blades and Plows, Which Throw the Harvested Crops into Windrows; Depressed, the Plow Points Cut Shallow Furrows, a Third Point being Added if Desired

EXPLORER WOULD USE WASTES OF NORTHERN CANADA

Life among the Eskimos who had never seen or heard of white men, expeditions to Cape Parry, to the delta of the Mackenzie River, and to other points on the dreary north coast of Alaska and Canada, all make Vilhjalmur Stefansson, the arctic explorer, one of the world's authorities on questions concerning the arctic lands of North America. And, in consequence, the Canadian government has listened with the closest attention to his plan for the development of this virgin region by the introduction of herds of reindeer and the domestication of the musk ox already there. He points to more than 1,000,000 square miles of grazing land, totally unfitted for ordinary cattle, but almost ideal for these two hardy species. The reindeer would flourish there almost without question, in view of the astounding growth of the herds given to the Eskimos of arctic Alaska by the United States Government about 20 years ago. And it seems certain that the hairy little musk ox would do equally well with state care and protection. The explorer feels confident that the waste lands of northern Canada will be transformed within 25 years.

RADIOACTIVE SALTS USED IN LIGHTNING ARRESTER

A radioactive salt, such as radium chloride, is included in the tube of a new French lightning arrester of the vacuum-tube type, used in protecting electrical circuits from high-potential discharges. The consequent ionizing of the electrodes is declared to reduce the retarding effect of the spark gap so that the action of the arrester is practically instantaneous.

THE "HERMIT'S" PROTEST

IN our April magazine we published an interesting story of a California hermit who was such an attraction to tourists that the management of Yosemite Valley had induced him to make his residence in the park for a certain period of the year. Shortly following, greatly to our surprise, we received a letter, beautiful in script, from the hermit himself. We were pleased to learn that a bona fide nature-loving recluse could not be induced to change his haunts for profit as one changes a position in commercial pursuits. There is enough of the hermit longing in every thinking man and woman to induce us to depart from our custom of avoiding personal matters and publish the letter verbatim, trusting that our contented friend may not be the subject of too much envy.—Editor.

In the April (1919) issue of Ur magazine there appeared an article about a Hermit near Palm Springs, Riverside Con. Cal. who was said to have been "transplantet" to Yosemite Valley, Cal. to draw curious tourists.

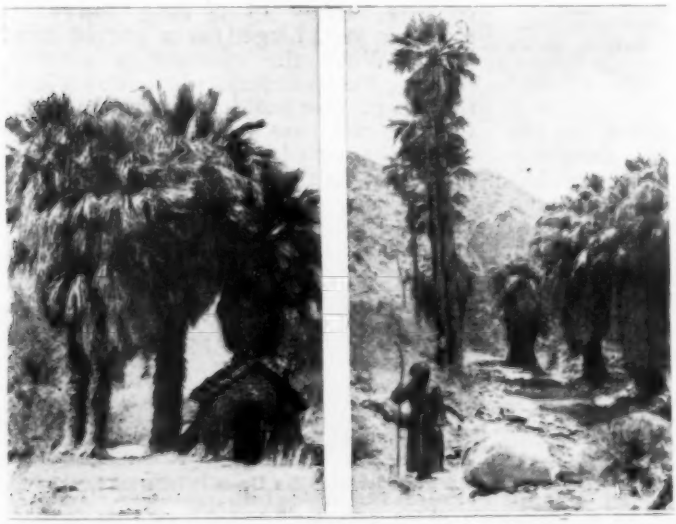
Well, I am that "Hermit," yet I *don't* know anything about that "transplanting" proposition. My name + Photo has appeared in a number of Papers + Magazines, mostly without my knowledge or consent + always *misrepresentet* and now comes this *greedy* promoter *misusing* my name to *deceive* the public + I wonder just how much right any person has, by Law, to use or misuse another's name, without his knowledge, to *deceive* the unwary public? In 1918 I worked for 5 weeks at Camp Curry, Yosemite, when I left was asked to return in 1919 to take a certain job, but I gave no promise or encouragement. These 5 weeks were more than enough to convince me that there is no better place for an undisturbet outdoor life than the little inhabitet vastness of the Desert with its dry climate + absence of mosquitoes.

Where the Hermit Now Lives: This Cabin is Built Entirely of Palm Logs and Leaves, with the Exception of the Doors and Windows. However, a Dirt Road has Recently been Constructed near It, Making It Too Dusty for One Who can Live Wherever Nature Most Invites

I am still living near Palm Springs, in a cabin built of Palm Logs + Leafs, *not* in a Cave, + won't leave here just to play into some promoter's hands. Should I leave, I will do so when I please + go where I please, none has strings on me + my trail is allways open.

Hoping that U please will print this to help U'r readers I am respectfully Urs

Wm. Pester, Hermit



The View on the Left Shows a Cabin Built of Pine Leaves on a Frame of Young Sycamore. The Hermit Lived Here Several Years. There Is a Hot Sulphur Spring in the Vicinity. Malicious Persons Burned This Attractive Desert Dwelling. At the Right is Shown a Favorite Haunt of the Hermit—Palm Cañon

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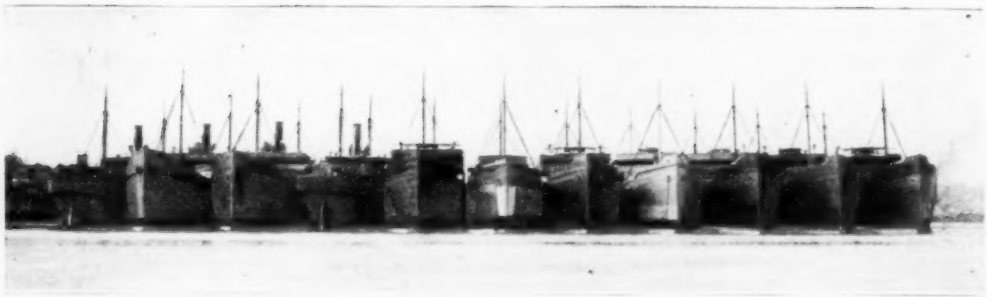
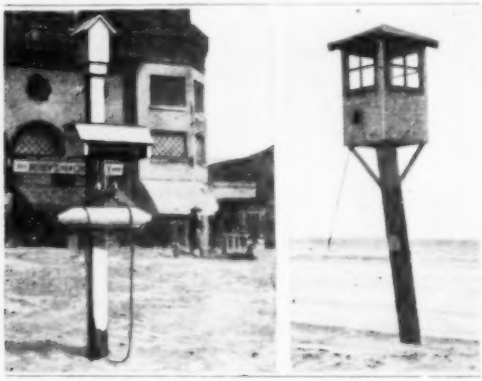
¶Post-office authorities have announced that registered mail will now be accepted for delivery in both Turkey in Europe and Turkey in Asia.



These 3,500 and 4,000-Ton Wooden Ships of the Emergency Fleet Corporation Are Part of the Fifty Which Lie Idle in the Harbors of the Pacific Coast. The Green Timbers Used in Their Construction are Said to Have Shrunk on Their Maiden Voyages, Making Them Totally Unseaworthy

LIFE-PRESERVER STYLES AFFECTED BY WAR

Torpedo-shaped life preservers are the unusual feature of the life-saving precautions taken at a Pacific coast bathing



The Authorities at a Pacific Coast Bathing Beach have Installed These Torpedo-Shaped Life Preservers, and Erected the Tower from Which a General Watch will be Kept

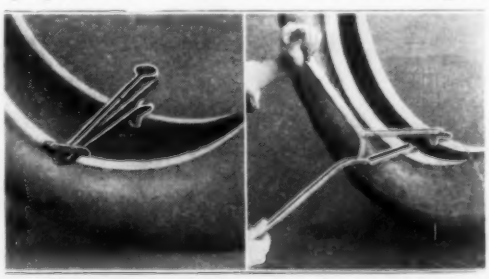
beach this season. As a reason for the change from the traditional doughnut type, it is said that the warlike model is much easier to throw, and to pull through the water. In their attempt to safeguard the bathers in every possible way, the authorities have placed these torpedo-like preservers at frequent intervals along the beach, and have erected an elevated lookout station from which a general watch may be kept.

GREEN TIMBERS RUIN SHIPS OF EMERGENCY FLEET

More than fifty new wooden steamships are lying idle in various harbors along the Pacific coast, with the prospect of continuing to lie there until they fall apart from old age. They offer a mute testimony to the inevitable waste of wartime construction, as they were hurriedly built by the Emergency Fleet Corporation, of green timbers which are said to have shrunk on their maiden voyages, permitting the seas to pull the calking out of the seams. They have therefore been declared unseaworthy, and now represent a total loss to the government, as no private interests will charter them.

TOOL FOR SPREADING TIRES IS HELP TO MOTORISTS

A tool is most desirable when it lightens a back-breaking task into an easy one. Automobile drivers are all too familiar with the strain of spreading apart the beads of a tire. A simple tool, made of three pieces of cold-rolled steel, now does the job with the smallest of efforts. It consists merely of a long and short spreader jaw, hinged to a curved hand lever. When the spreader is inserted, pushing the lever forward and down locks the tire in open position. A larger model, for big truck tires, has two levers and requires the use of both hands; but so employed, it handles with ease the largest



The Spreader, Handles Open, is Inserted in the Tire, as at the Right. When the Handles are Closed, as at the Left, the Tire Beads are Held Apart

sizes of pneumatics made, of which unassisted manual manipulation is all but impossible.

BRITISH PREMIER'S ALTERED DH-4 SHOWS UNUSUAL SPEED

General Seeley, British Under-Secretary for the Air, was recently carried to Paris in record time by Premier Lloyd George's De-Haviland biplane, pictured on page 511, Popular Mechanics Magazine for April, 1919. The distance from Folkestone, near Dover, to Paris, practically 170 miles, was covered in only 74 minutes. The remarkable feature of the performance, however, is the general's belief that the high speed was made possible by the shape of the fuselage, enlarged and covered to protect the distinguished passengers. It is said to decrease wind resistance so decidedly that speed is increased 10 miles an hour.

¶ The fishing interests of Alaska are petitioning for legislation that will protect the spawning grounds of the salmon from the depredations of the ignorant and irresponsible.

BOSTON'S GERMAN HOWITZER CLAIMED BY TWO STATES

Boston Common now boasts an ugly German howitzer which was captured near Chateau-Thierry last July. The folks in Boston insist that the big fellow was taken by doughboys from Massachusetts, but a congressman from Connecticut is equally sure that boys from his state turned the trick. He has stated that he will attempt to secure congressional action unless the gun is removed to Hartford.

The Present Question Is, Who Captured This German Howitzer, Now on Boston Common. A Connecticut Congressman Claims the Gun for His State; Massachusetts People Are Equally Certain That Troops from Their State Had the Honor

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NEW CHAIN CONVEYOR REMOVES DANGER TO STEVEDORES

The installation of traveling-chain conveyors for loading hand trucks from boat deck to pier level has always proved an economy. The apparatus pictured is driven by an electric motor through a clutch that slips on overloading to prevent breakage. It is fitted with a joint near the top to allow for rise and fall of the tide, carries a pusher to engage with the truck axle every 12 in., and has the added advantage that the pushers drop through the pier floor in a vertical position, avoiding all danger to the feet of the stevedores, and thus removing a long-standing objection to machines of this sort.

The Distinguishing Merit of This Traveling Chain Conveyor Lies in the Arrangement of the Pushers Which Engage with the Truck Axles. On Reaching the Warehouse Floor They are Drawn Down Vertically, Thus Obviating Danger to the Feet of the Stevedores

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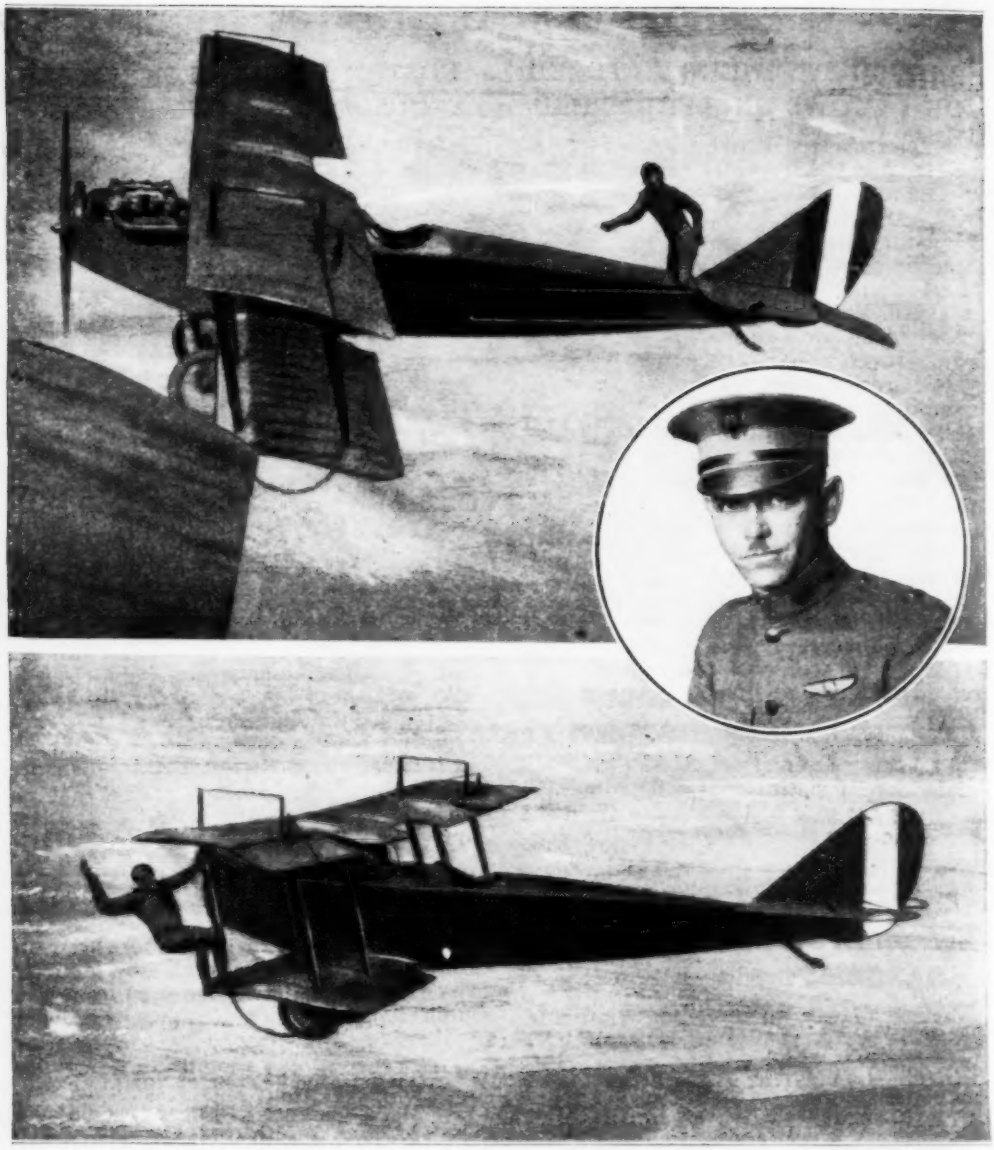
¶ Rats have developed such a taste for casein glue that it is now declared dangerous to hold in storage an airplane made up with that substance.



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The Portrait has Caught Lieutenant Ormer L. Locklear, of Fort Worth, Texas, in a Quiet Moment. The Other Two Photographs Are More Characteristic, However, the Upper Showing Him About to Walk Up the Fuselage from the Tail to His Cockpit, the Lower Catching Him as He Waves a Friendly Greeting with One Hand and Hangs to One Thin Strut with the Other

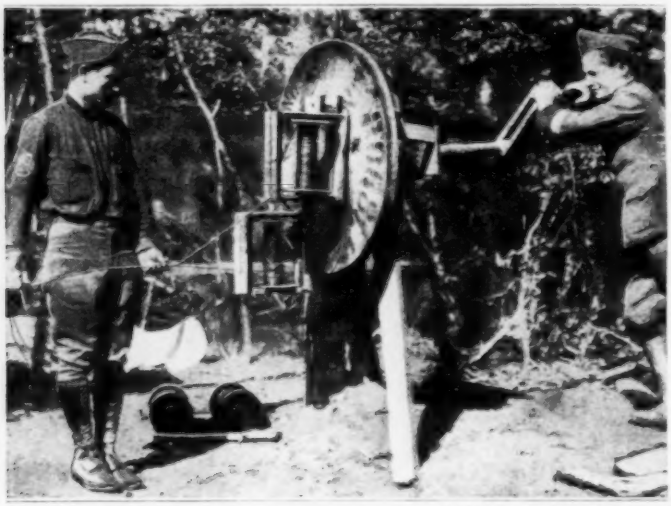
MID-AIR LEAPS FROM AIRPLANE TO AIRPLANE HAVE SERIOUS PURPOSE

HIGH-altitude acrobatic feats in an airplane are losing their thrill through frequency of performance. Two men in particular, Lieutenant Ballough of the British Army and Lieutenant Locklear of the U. S. A., have demonstrated their faith in the stability of air craft. Lieutenant Locklear speaks very undramatically of his drops from one plane to another, of his acrobatics on the undercarriage, and of other flirtations with gravity, insisting that the feats seem remarkable only because of their novelty. He points to the aerial pioneers who were declared lunatics a few years ago for doing loops and other stunts which are now in every airman's repertoire. In the same way, he declares, his experiments with the stability and coöperation of airplanes are simply showing the world what is to be expected of the developing science of aviation. For instance, precious mail could be rushed across the continent without a stop, being transferred in mid-air from one plane to another. Or he might vary the program by flying a ship from New York to San Francisco without touching ground, securing gasoline and other supplies, when necessary, from tender planes which would meet him at scheduled points in the sky, where they would draw alongside and fill his tanks through long rubber tubes.

The American Lieutenant Who has Recently Astonished the Oldest Airmen with His Leaps from One Plane to Another Explains That He Simply Climbs Past His Pilot, Worms His Way under the Wing, and Sits on the Axle of the Undercarriage. Here He Waits Until the Other Plane is Flying Steadily About Eight Feet Directly beneath Him, When He Hangs by His Hands, Lets Go—and There You Are

IMPROVISED WIRE TWISTER BUILT UNDER FIRE

The policy of the American army, which trained every man to think and act for himself in an individual emergency, was vindicated again and again under fire. The wire twister in the illustration, for example, was built from odds and ends by men of the Signal Corps during the St. Mihiel action. It was just part of the day's work, but it probably saved its quota of American lives.



PHOTOGRAPH BY SIGNAL CORPS, U. S. A.

American Brains Got Busy When a Detail from the Signal Corps was Ordered to String Twisted Wires along the Trees during the St. Mihiel Drive. This Crude but Effective Wire Twister Was the Result

BRITISH COMPANIES PREPARE FOR AVIATION INSURANCE

More than a score of the leading British insurance companies are interested in a comprehensive scheme for aviation insurance. Four classes of risks will be provided for: damage to machines; accident to pilots and passengers; loss of or damage to goods in transit, and injury to the public or to public property. The companies are sure that large policies will be taken out as a consequence of the great size of many ships now building, and are therefore prepared to pool their enormous resources in order to offer any security desired, or to cover any possible loss.

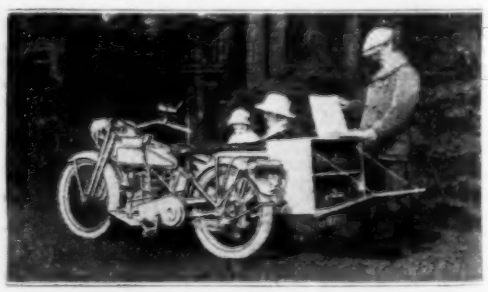
¶A mid-western city will hereafter name each new concrete bridge in honor of some local hero who lost his life in France.

RADIATION FROM FINGER TIPS DECLARED A FACT

Experiments with a supposed radiation or effluence from the human body have been conducted by a Swedish psychologist with graphic results. The effluence, flowing most readily from the finger tips, is said to cause actual nervous sensation and even muscular contraction on the body areas experimented with. The scientist has gone farther, too, by handling the body emanation almost like an electric current. Thus, he finds that the odd radiation passes through glass or metal, but seems to be arrested by cardboard or wool; he reflects it against a sheet of metal, and even conducts it along a rod bent at right angles. His work seems to discredit the skeptics, who have long scoffed at the hypnotist's mysterious "passes" over his subject.

LUGGAGE CARRIER ON SIDECAR INCREASES TOURING COMFORT

The addition of a capacious luggage carrier to the rear of his sidecar has enabled one motorcyclist to tour en famille with complete comfort. The idea is a good one and well worth the attention of those who enjoy extended sidecar trips.



By Adding This Luggage Carrier to His Equipment the Motorcyclist has Considerably Increased Touring Comfort. An Auxiliary Set of Springs Carries the Extra Load

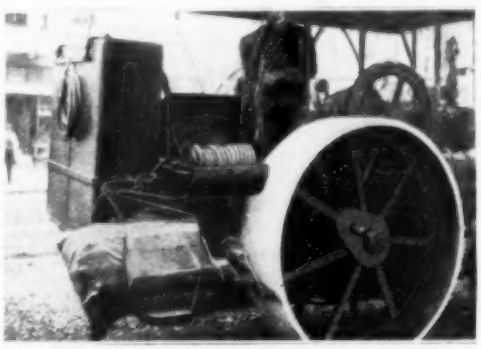
To permit heavy loading, in this case, the sidecar suspension was reinforced with a set of six-leaf cantilever springs.

AIRPLANE HELPS ARCHITECT PICK SITE FOR VILLA

A Florida architect was recently commissioned by a client to select the most desirable location for a seaside villa. He investigated, and found that the client's property stretched inland from the ocean beach, but was so marshy and overgrown with vines and creepers as to be quite impenetrable. As there were no tall trees to climb, the architect returned to town, hired an airplane and pilot, and flew back and forth over the property until he had picked the site.

STEEL CYLINDER PROTECTS HOSE ON STEAM ROLLER

As a city ordinance prohibits parking within 25 ft. of a fire hydrant, the street department of Oakland, Calif., has equipped its steam roller with a 50-ft. length of hose for filling and washing the boiler. For convenience, it is carried at the rear of the machine on a reel, which is inclosed in a steel cylinder. The upper

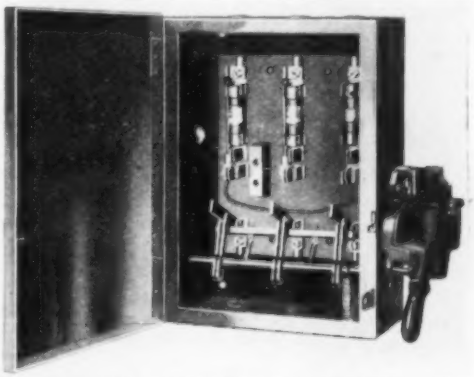


For Filling and Cleaning the Boiler This Steam Roller Carries a 50-Foot Hose Which is Guarded by the Cylinder, Shown Open in the Picture

section of the cylinder is hinged to form a lid, which may be padlocked for protection against thieves.

STARTING SWITCH PROTECTS BOTH MAN AND MOTOR

A motor-starting switch recently put on the market secures the safety of both man and machine. The operator is protected by a lock which will not permit the switches to be thrown unintentionally when the door is open, thus eliminating the common danger of shocks and burns. The motor is guarded by a coil, which releases a catch when the voltage drops to the danger point, thus allowing a heavy spring to open the switches. Another feature is the arrangement of contacts by which the blades do not leave the starting

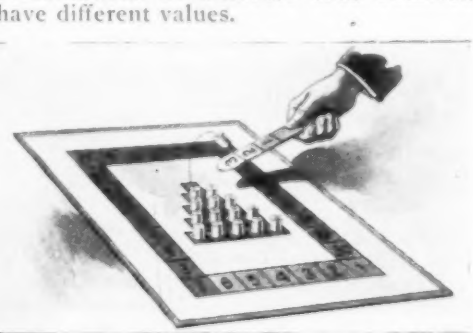


Workmen are Protected from Shocks and Burns by This Motor-Starting Switch, Which can be Thrown Only When the Steel Door is Closed

position until they have entered the running position, thus avoiding an "arc" at this point in the operation.

NEW GAME OF JUMPING BLOCKS DEMANDS SKILL—AND LUCK

Moving the pieces, or "men," by pressing a small paddle on their upper edges, is the feature of a new game of skill. The 15 men, of about the same height as diameter, bear numbers on both top and bottom whose sum is 31. A triangle of 15 one-inch squares, numbered 1 to 15, occupies the center of the board, surrounded by a border of 28 two-inch squares, numbered 1 to 14 and 17 to 30. Spaces on the paddle are also numbered 3, 2, and 1. The player may jump the man he selects either onto the paddle or into the border square whose number corresponds to one of the marks on the piece. The various combinations of numbers thus obtained have different values.



In This Game the Pieces, Numbered on Both Sides and Occupying Numbered Squares, are Jumped to New Positions with a Paddle

SMALL BOLSTER BRINGS EASE TO BEDRIDDEN PATIENTS

In hospital practice it is often desirable to maintain a patient in a sitting or semi-reclining posture. In cases of extreme weakness, the patient has heretofore been supported in this position by any means that came to hand; but there is now on the market a small bolster designed for this very purpose. It is essentially an enameled cylinder, covered with a hair mattress and pillow slip, and firmly held beneath the patient's thighs by two canvas strips attached to the head of the bed.

This Little Metal Bolster should Save Hospital Attendants Much Effort in Maintaining a Patient in Any Desired Position

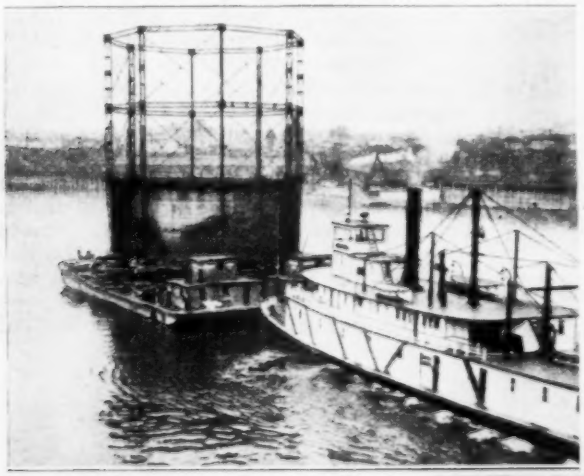
TRACTORS GO TO PRIBILOF ISLANDS TO HAUL BONES

The discovery of a deposit of fossil seal bones in the Pribilof Islands, off the southwest coast of Alaska, has resulted in complete plans for its exploitation. Four track-laying tractors will haul the bones over the deep sands of the islands to the grinder, already installed, which will prepare the material for market. The find should pay well, as the stuff will be brought to the United States as ballast in the hulls of returning government boats.

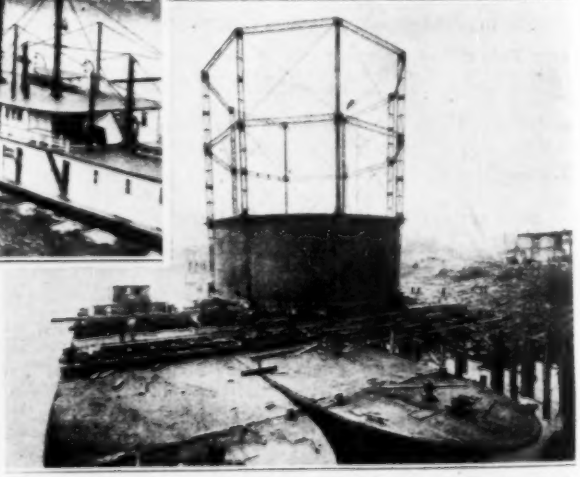
¶A skater in Stockholm, Sweden, has established a world's record by traveling 10 miles in 31 min. 7½ seconds.

TOW HUGE GAS TANK UP RIVER ON RAFT OF TWO BARGES

Most adaptable of transportation routes, the larger waterways often bear strange burdens. Up the Willamette River, in Oregon, not long ago, an energetic tug towed a huge raft made by tying two big river barges side by side. On the improvised float rested a gas holder 67 ft. in diameter, towering approximately 100 ft. above the water. The 250-ton tank was moved over beams and rollers from the gas plant at Portland onto the barges, floated 1½ miles, unloaded by the same process, and moved overland 1,000 ft. or more. It was finally installed in a shipyard, whose huge consumption of gas had made a local tank necessary.



Huge Gas Holder being Towed Up River on Its Two-Barge Raft: In This Position Its Framework Towered a Hundred Feet above the Surface



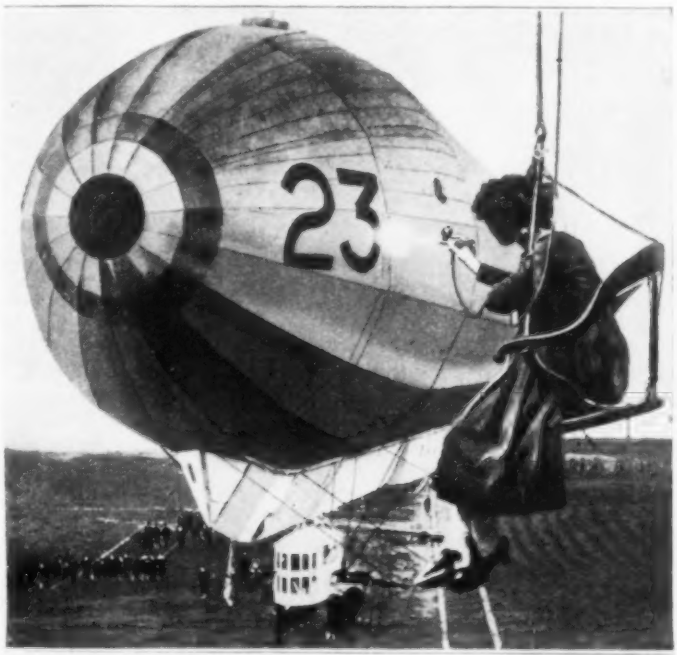
Illustrating the Somewhat Ticklish Task of Loading the Tank onto the Raft, by Means of Heavy Beams and Rollers

IMPERVIOUS CONCRETE MADE BY NEW ENGLISH PROCESS

By admixing a liquid of secret formula to the water used in mixing concrete, an English inventor evolves a product impervious to moisture. The new ingredient is asserted also to strengthen the adhesion of the concrete to its reinforcing members, to increase its density, and accelerate its setting. Tests of such concrete indicated a tensile strength 12½ to 15 per cent greater than that of ordinary concrete; compression strength 33 per cent greater, and complete imporosity after drying. A porous brick took up 1 lb. 12¾ oz. of the preparation, was dried for 48 hours, and then failed in 15 minutes to absorb any water whatever. The prepared concrete is affected by nitric, hydrochloric, and acetic acids, but not by the strongest sulphuric. This suggests for it a possible place in the chemical industries, as for sulphating tanks. The liquid also finds a use for treating timber, and is declared to harden it and render it fire and water-proof.

HUGE COLORED PHOTOGRAPHS ILLUSTRATE WAR WORK

By means of an exhibition of enormous enlarged photographs the British public is now learning more of the gallant work done by its Royal Air Force during the war, in France and half a dozen other lands. It is hoped that the display may later reach the galleries of the United States and Canada. In addition to the work of enlargement, the photographs have been appropriately colored with the air brush.



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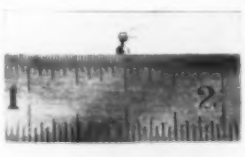
To Enable Her to Color All Parts of the Enlarged Photograph, This Girl was Suspended from the Rafters of the Studio. The Photograph Is One of Many Illustrating the Work of the British Air Service

TINY TURBINE ENGINE NO LARGER THAN PINHEAD

The man who built what is reputed to be the smallest electric motor and the smallest steam engine in the world has now completed a turbine engine, weighing only 12 milligrams (not quite two-tenths of a grain), and in size about as large as an ordinary pinhead. The steel rotor, or revolving part, is .032 in. in diameter, and has six slots. The case is made of gold. As steam is too heavy for the tiny mechanism, the turbine is run by air injected through the hollow base. The little engine is shown in actual size.



CENTRAL ICE PLANT SUPPLIES FRESH BEEF TO A. E. F.

The inhabitants of a muddy little town near the headquarters of the Service of Supply, A. E. F., had never heard of water being frozen in the summer time, until an American engineering regiment came to town. Directing the work of thousands of labor troops, the regiment constructed a great refrigerating plant that supplies the whole expeditionary force with fresh beef. It is stated that no other army on the continent is thus supplied from one central plant.

The Children, Ranging in Age from Four Years to 14, Go through Their Daily Exercises on the Upper Decks of New York City's "Day Camps," Two of Which Now Accommodate About 475 Children, Out of an Estimated 216,000 Who Need Attention Because of Undernourishment. A Physician and Three Nurses Direct the Work

FLOATING PREVENTORIUMS

By WILLIAM D. GOODWIN

THERE are in the city of New York 216,000 children between the ages of four and sixteen who are undernourished, according to a recent report upon the subject.

For the benefit of such children, suffering from malnutrition, the Department of Health in that city has established so-called "preventoriums"; one known as Day Camp Manhattan, at the foot of East 90th Street, the other, Day Camp Rutherford, at the foot of North Second Street, Brooklyn. These are experimental stations where the effort is being made—and with marked success—to show how children, who might later fall a ready prey to tuberculosis, can be fortified against that and other diseases.

This Is "Day Camp Manhattan," an Old Ferryboat Remodeled and Moored to a Dock in the East River. At the Center of the Lower Deck Is the Kitchen, and at Its Left the Room of the Nurse in Charge, and Her Assistant

In casting about for locations for such purposes, old ferryboats, which had seen better days, were remodeled and moored at the docks on the East River. While, at present, only about 475 children can be accommodated at these two camps, it is hoped later on to establish other camps of a more permanent nature, where children may be cared for both night and day.

Both camps are equipped with schoolrooms, playrooms, a kitchen, dining rooms, shower bath, and a dental clinic. The public schools, clinics, and charitable organizations, each furnish their quota of children who attend the camps. Weather permitting, all the school duties — which are directed by three teachers at each camp— exercises and games are enjoyed in the open air. All the children are under the careful supervision of a physician and three nurses. At least once a week each child is weighed, and a record is kept. Their teeth are carefully attended to, and other physical defects, such

as enlarged tonsils and adenoids, are remedied. Those who lack appetite are given tonics, and are induced to eat proper food, and plenty of it. This part of the camp life is insisted upon by the nurses in charge.

As the children remain in the camps only about eight hours out of the 24—they go home at night—it is impossible to give them sufficient food to cover the 24-hour calorie requirements; but many children receive during their stay at home food enough to bring the calories up to the normal quantities. Their home food, however, is frequently of inferior quality and not selected with any consideration of the needs of the child. To overcome such defects the children are instructed in food values, and the important relation between eating the proper things for the development of health and the general normal growth of the body.

Table etiquette also receives attention, and the campers are taught to set the table properly. At the tables the children are arranged in three groups by age: from 4 to 7 years, from 8 to 10 years, and from 11 to 14 years. Calories required for 24 hours for those from 11 to 14 years old are 2,000 to 3,000, and a sample menu for those of the latter age is as follows:

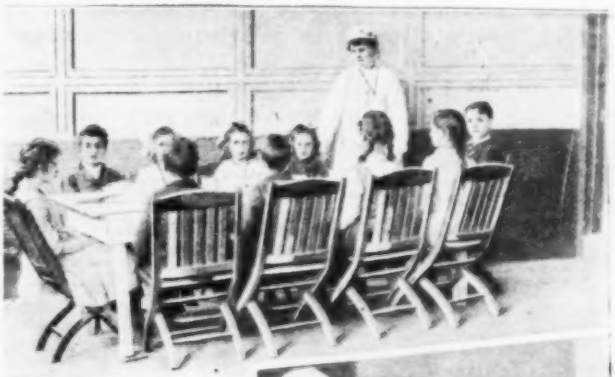
Breakfast: One soft-boiled egg, eight ounces of milk, and three slices of bread with butter.

Dinner: Four ounces of roast beef; two medium-sized boiled potatoes; two tablespoonfuls hot buttered beets; same quantity of stewed apricots; one slice of bread, and six ounces of milk.

After-school luncheon: Six ounces of milk or cocoa and three slices of bread with butter.

An essential feature of the camps is the visiting nurse who calls at the homes of the children and talks personally with the parents on the importance of proper ventilation, suitable clothing, frequent baths, proper food, and care of the children's teeth, and induces the parents to visit the camps and see just how their children's health is being built up.

Under the conditions of this camp life a marked improvement in the physical condition of the children is soon noted, and a continuous gain is made from week to week. As soon as the effects of malnutrition in a child have been overcome and any tubercular tendencies stopped, it



In This Dining Room on the Lower Deck the Balanced Rations Have a Chance to Prove Their Efficacy in Overcoming the Ill Effects of Undernourishment. The Children Are Always Ready to Assist in This Demonstration

One Corner of a Study Room in the Open Air of the Upper Deck: In The Background Is a Slate Blackboard

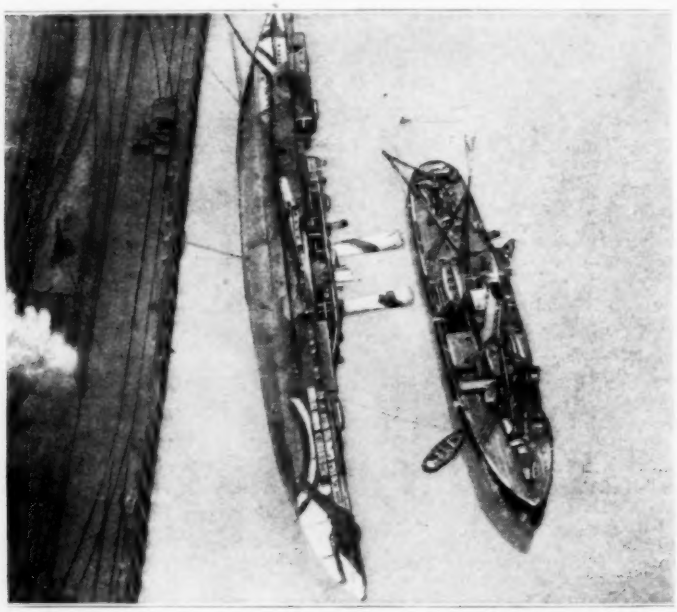
Next to the Meal Hour, This, Which Follows It, Is Perhaps the Best. The Deck Chairs Are Comfortable, the Upper Deck Is Breezy, and There Are Plenty of Wraps

graduates from the camp healthy and well, and educated in sane methods of hygienic living.

The camps are open all the year, making it possible for many children to become healthy, physically and mentally, while the knowledge they obtain is carried to the parents, to enable them to attack and obviate preventable disease. Perhaps the most valuable feature of these camps is that they apply a new method of preventing tuberculosis, namely, to attack the problem at its root by building up the powers of resistance in children whose constitution would otherwise favor development of that plague.

SHIP RAISED BY LOCOMOTIVES WHILE FLIER TAKES PHOTO

Five powerful locomotives performed an engineering feat of unusual character when they were used, after a recent accident at a British dock, to raise a capsized ship. A transport had caught fire at the dock, and burned so fiercely that its officers were forced to scuttle it. In sinking, it turned over on its side, from which position the locomotives hauled it back to normal with cables.



View Taken from an Airplane of an Unusual Feat in Ship-Raising: A British Transport, Burning at the Dock, had Turned Over in Sinking, and was Righted by Five Railroad Locomotives Hitched to It with Cables. The Vessel at the Right Is the Salvage Ship

A "thirst cigaret," devised by a Swiss inventor, is the latest provision against drought. It will not alleviate the July aridity in this country, however, being merely a tube containing a compound of licorice, citric acid, sugar, water, and amyl acetate. Held in the mouth, it allays thirst when water is not available.

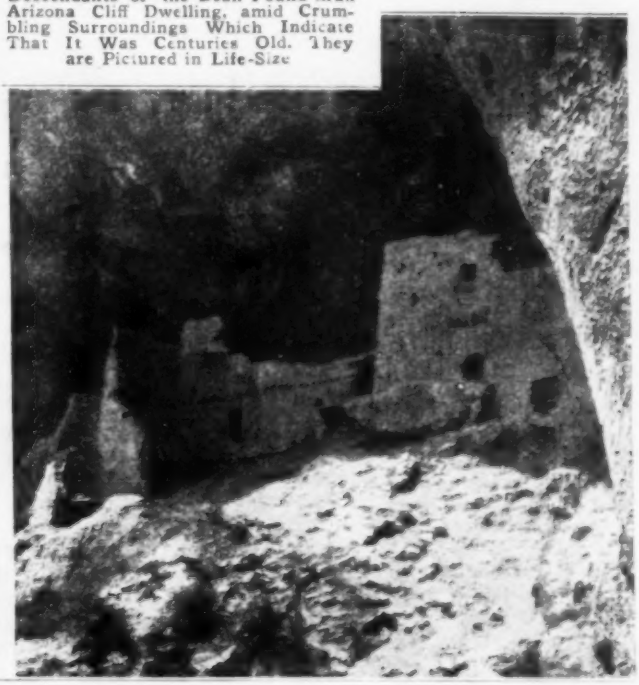
PROMENADE DECK FEATURE OF RUSSIAN AIRPLANE

Russia's foremost aeronautical engineer, M. Sikorsky, has arrived from overseas to announce that he will place on the American market a large plane of his own design, intended for freight and passenger traffic. The designer constructed battle planes for Russia while she was at war with Germany, and since the spring of 1918 has been working for the French government, chiefly upon the model which he now presents for commercial use. The craft has a wing spread of 115 ft., a length of 87 ft., and is driven by four motors at an average speed of 90 miles an hour. Exclusive of the crew of six, the body accommodates 32 passengers, who can watch the scenery slide by through observation windows and the glass floor. For the more adventurous, the inventor has even provided a promenade deck along the lower wings. Electric light, heat from the exhaust gases, a kitchen, a luggage room, and a lavatory assure additional comfort.

BEAN FROM CLIFF DWELLING SPROUTS LIKE ANY OTHER

During a vacation trip among the crumbling cliff dwellings of Arizona, it was one man's good fortune to stumble upon a small cave, hitherto unopened. Dislodging the bowlders that had blocked the entrance for quiet centuries, he was greeted by the customary sitting skeletons. His really important find, however, was made when he pried off a slab of

These Large Beans Are Lineal Descendants of the Bean Found in an Arizona Cliff Dwelling, amid Crumbling Surroundings Which Indicate That It Was Centuries Old. They are Pictured in Life-Size



PHOTOS BY COURTESY OF STANDARD OIL BULLETIN

The Lucky Discoverer of the Prehistoric Bean is Shown at the Left beside the Plant Which He was Able to Grow from It. A Well-Sealed Niche in a Cliff Dwelling, Like the One at the Right, Yielded the Strange Link with America's Unrecorded Past

rock that sealed a pocket in the wall. He found beans. They were fine, large beans, too, all clinging together in a solid mass that seemed to indicate the decay of the receptacle that once had held them. At his touch all disintegrated save two. These he carefully pocketed, carried to his home, and planted. One grew, and is said to be today the ancestor of big, healthy beans that are declared by many seedmen to be of a new variety.

¶It is announced that all citizens who have not exercised homestead rights elsewhere in the United States since July 8, 1916, are eligible to file on homesteads in Alaska.

BARGES FOR ATLANTIC COAST BUILT IN QUINCY, ILLINOIS

The contractors, at Quincy, Ill., who built 10 coaling barges for the United States Navy, are proud of their achievement. Theirs was the first government shipbuilding contract to go to a city on the upper Mississippi, and they feel that the barges should prove to the whole nation the value of the river cities as potential shipbuilding centers. The vessels are a genuine product of the river states, as both workmen and material came from the valley, while power from the great Keokuk dam drove the compressed-air boring and riveting machines.

TURN ON WINDLASS DRAINS FISHERMAN'S CATCH

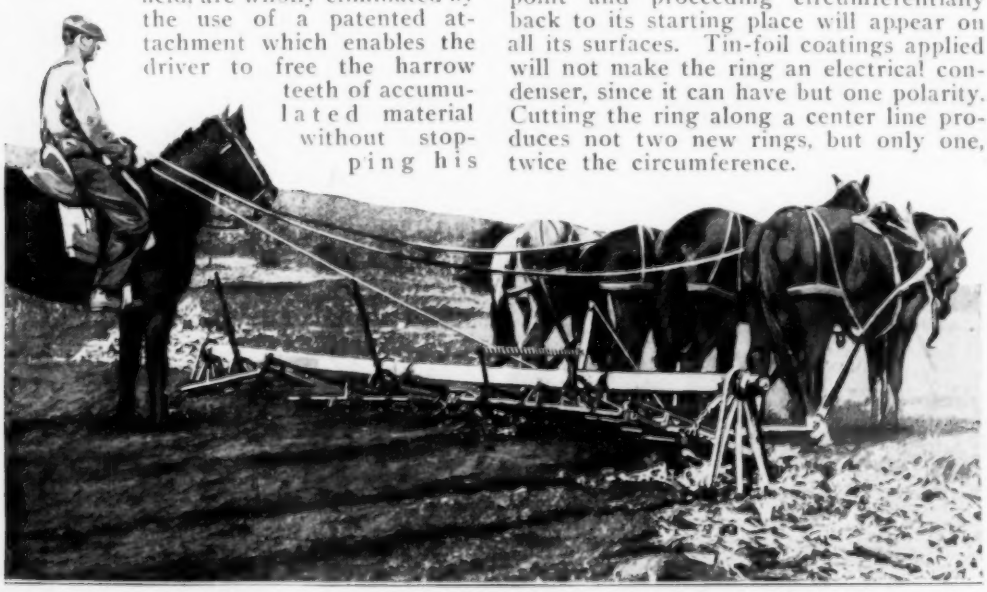
The little landing stage illustrated in the photograph has two merits that recommend it to local fishermen. The first is the hand windlass that lowers and raises the platform with the ebb and flow of the tide; the other is the screen-bottomed box, or well, which is fastened to the staging, and may thus be lowered into the water to keep the catch fresh and lively, or may be raised and drained to permit the fisherman to string his catch at the end of the day.

ATTACHMENT SAVES TIME IN CLEANING HARROW

Delays caused by the necessity of stopping to clean harrows while cultivating a field, are wholly eliminated by the use of a patented attachment which enables the driver to free the harrow teeth of accumulated material without stopping his horses. Mounted transversely on suitable brackets above the implement is a wooden shaft with a segment of a wheel at either end. Normally these segments extend toward the rear. When the harrow is to be cleaned the driver pulls a cord connected with a lever having a pawl that engages a ratchet on the shaft. This turns the latter on its axis, swinging the segments forward. As the implement moves along, the segments swing under the shaft, lifting the harrow and allowing the débris to fall from the teeth before they again strike the soil.

OBJECT WITH ONLY ONE SIDE IS MATHEMATICAL NOVELTY

A sheet of paper with only one side might well head a list of obvious impossibilities. Yet mathematicians of late have been studying an arrangement which, from the scientific standpoint at least, is just that. The demonstration is simply a strip of paper given a half twist and then joined at the ends into a ring. Such a ring has no definite inner and outer surfaces; they are both the same. A pencil mark started at any point and proceeding circumferentially back to its starting place will appear on all its surfaces. Tin-foil coatings applied will not make the ring an electrical condenser, since it can have but one polarity. Cutting the ring along a center line produces not two new rings, but only one, twice the circumference.



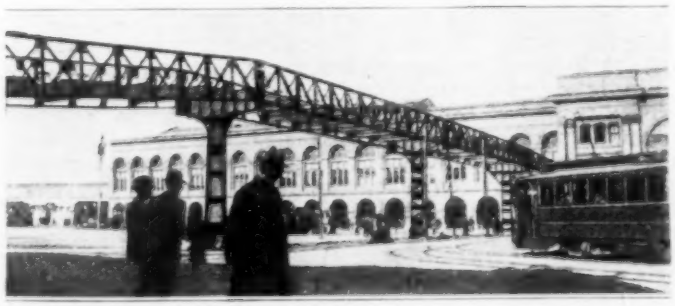
Harrow Equipped with an Attachment Which Cleans the Teeth of Débris Automatically: The Segments of Wheels are Here Shown Lifting the Implement off the Ground, so That the Accumulated Matter will Fall Away and be Left Behind

CRYSTAL-SURFACE EFFECT WITH NEW LACQUER

Surfaces with a rough, crystalline effect are produced on metal by the use of a new lacquer. The crystals develop about eight hours after the coating is applied, by spraying or dipping, and are coarse or fine as the application is heavy or thin, the crystallizing process being completed in 24 hours. Old methods of mixing sand with the lacquer, or sprinkling it on the wet coat, were objectionable because the finish wore off, dimmed the color, or was not uniform. The new process is declared completely to overcome these defects, and to afford a finish as durable as that of any lacquer, with the full color value retained.

VIADUCT CARRIES TRAVELERS OVER WATER-FRONT TRAFFIC

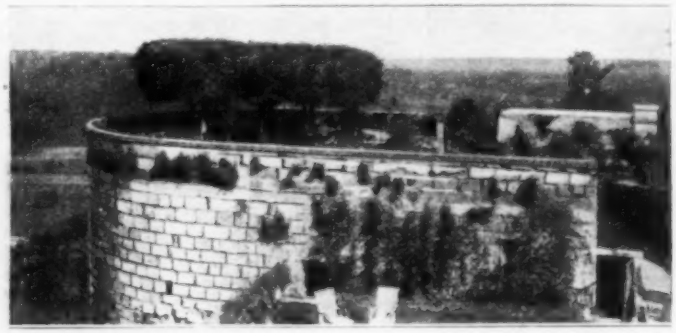
Throughout the day the doors of a busy San Francisco ferry terminal used to discharge crowds of travelers into the swirl of water-front traffic. This condition was not only an inconvenience to everyone, but a positive danger to pedestrians; so, to banish it, a steel viaduct, or footbridge, has been built by order of the State Board of Harbor Commissioners, which measures 393 ft. in length, 16 ft. in width, and clears the street by 22 feet. A hair-raising escape from the wheels of a motor truck no longer furnishes the stranger with his first impression of the town.



This Long Steel Viaduct Carries Travelers Safely from the Ferry Terminal over the Busy Water-Front Traffic. It Was the Only Solution for a Perplexing Traffic Problem

ANCIENT TOWER MADE TO ORDER FOR AMERICAN

That his country home at Coucy-le-Chateau, France, might be in completer harmony with its setting, an American recently decided to add to it a massive tower modeled after another in the neighborhood. His architect studied the model in detail, and was able to furnish him with a weather-scarred old pile that makes the oldest inhabitant rub his eyes. From the great beamed library, in the heart of the structure, winding stairways lead the surprised visitor to a sunlit garden on the roof, which yields a pleasant view of tilled and wooded countryside.



This Seemingly Venerable Tower, Topped with Shrubs and Flowers, was Built Only Recently by an American in Imitation of an Authentic Structure in the Neighborhood. The Details are Correct, Even to the Pitted Walls and the Winding Stairways

CEMENT CONTAINING GYPSUM GOOD FOR MARINE WORK

In the course of construction work around the Black and Azov seas, Russian engineers have found that cement made from slag, with a properly related proportion of gypsum, is quite satisfactory for bridge piers, docks, tanks, and other marine work. No swelling, cracking, or distortion occurred when 10 to 15 per cent of gypsum was used. A granulated slag-lime-gypsum cement developed in this work offers opportunity to put to good use some of the accumulated slag of war industries. When gypsum cement has proven unreliable as to volume, the reason is declared to be an improper ratio of gypsum to lime.

HIDEOUS IRON MASKS GUARDED CREWS OF FRENCH TANKS

The crews of the French tanks, who fought beside the Americans in the Argonne, were sometimes supplied with iron face masks, as in the illustration. They were rather hideous in appearance, but often proved a real protection against the flying shell splinters which inevitably penetrated the narrow slits which permitted observation by gunner and driver.

HOTEL FOR CHATEAU-THIERRY NEW MECCA OF TOURISTS

An American hotel, to be one of the largest in France, is planned for Chateau-Thierry. The famous scene of Franco-American triumph is expected to become a mecca for literal hordes of tourists, whose interest is not likely to abate for years to come. Increasing industrial activities already are crying for accommodations, which a syndicate backed by New York and Paris capital promises to supply, under the management of an American hotel man.

CONVENIENT TRAY SPEEDS UP MACHINE BOOKKEEPING

The requirements of modern, high-speed machine bookkeeping have developed several different trays that keep ledgers in good order when not in use, but are intended primarily to permit rapid fingering of the sheets, or cards, by the operator. The machine illustrated is built entirely of steel, and is designed for quick manipulation of the various parts. Thus, to commence posting, the operator inclines the back plate to allow the sheets to slope back, pulls a small lever to release the sheets, inclines the front plate, and throws over a second lever, which raises a "hump" at any point on the tray bottom. This last feature tilts the sheets to give additional ease in fingering.

REAL GOLDEN APPLE IS GIRL'S BEAUTY PRIZE

Eris, Greek goddess of discord, originated the custom of conferring a golden apple upon the most beautiful goddess. But there was no discord when a three-hundred-dollar apple of 14-ct. gold, designed by famous jewelers, was given to the most beautiful girl at a fraternal-society ball in Washington, D. C. The unusual prize was a graceful acknowledgment of the poesy of mythological legend.

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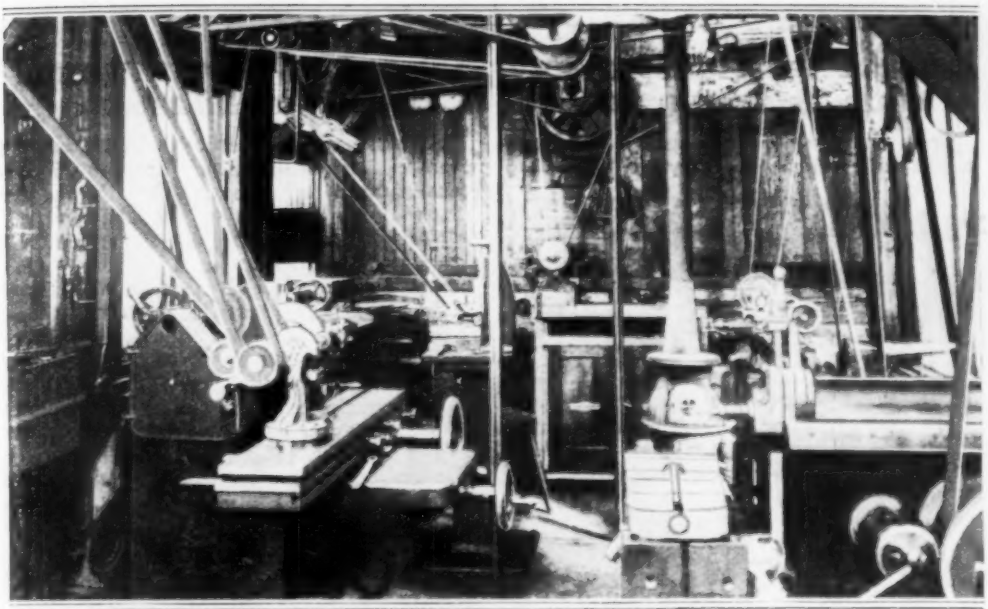
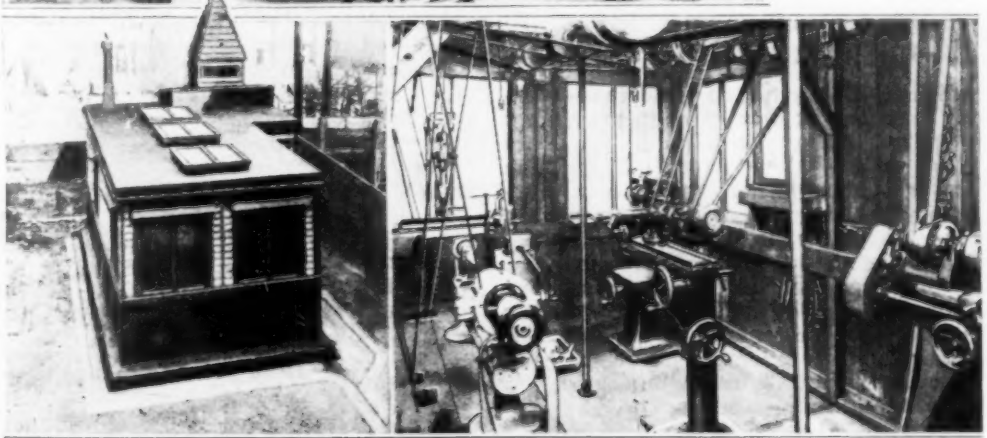
SMALLEST MACHINE SHOP BIG HELP IN WAR

Out from under the censorial lid that lifted with war's termination are filtering many curious facts. Not the least interesting of these revelations concerns a machine shop, probably the tiniest that ever boasted a building of its own. In this miniature plant, 18 by 12 ft., and 8 ft. high, were crowded six, and often more, expert toolmakers, who labored and perspired over war contracts throughout the 24 hours. The little shop was located in a Brooklyn back yard, behind an ordinary duplex house. It was erected on its concrete base in "knock-down" style, its 46 parts assembled by the hand of its owner, himself a toolmaker and inventor. Ten machines, driven by electric power, executed here an astonishing volume of work of such extreme precision that no rejections, it is positively declared, ever were recorded against the product. An accuracy of .0002 in. was habitually observed in the gauges and tools manufactured under unusual pressure. An amusing incident of the shop's history was the objection voiced by neighbors to its nocturnal activities, and the consequent suggestion of government officials that the neighbors "take rooms elsewhere."



The Busiest Corner of the Busiest and Smallest Machine Shop, Where, during the Last Part of the War, Precision Machines Almost Rubbed Elbows 24 Hours of the Day, with a Record of No Rejections for Their Product of Special Tools and Gauges

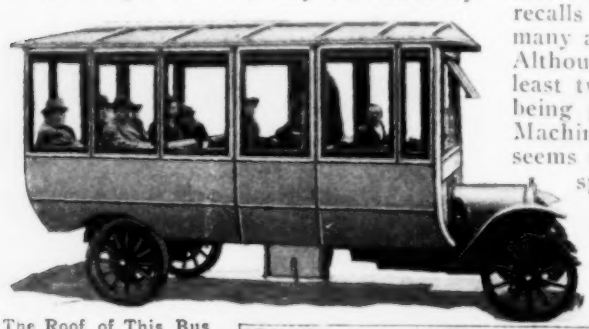
These Toolmakers' Benches Found Space, Along with Ten Machines, on the 12 by 18-Foot Floor of the Tiny Shop—to Say Nothing of the Six or More Expert Toolmakers



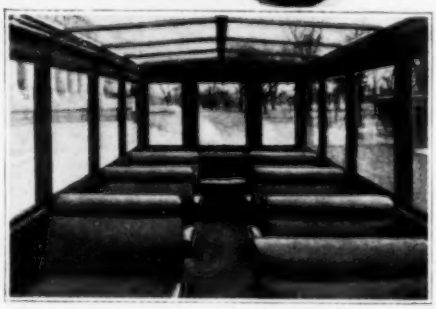
The Shop Building Itself, in All Its Eight Feet of Height and 216 Square Feet of Ground Space, is Seen at the Left, Occupying Its Site in the Back Yard of a Brooklyn Dwelling. The Right-Hand View Gives a Fair Idea of the Clustering Arrangement of Machines on the Parlor-Sized Floor

SIGHT-SEERS' GLASS-TOP BUS GIVES ALL-AROUND VIEW

Tall monuments and public buildings in Washington, D. C., may be viewed by travelers in sight-seeing busses without sticking their heads out of the windows. On one of these bus lines the roofs of the cars are made of thick, clear plate glass, reinforced by fine wire netting of wide mesh. The glass is set with rubber composition in a channel-iron frame, so the roof is leak proof.



The Roof of This Bus being Made of Glass, Its Passengers can See All the Sights of Washington, D. C., without Endangering Their Heads



As may be Seen, the View through the Glass Top is Unobstructed. The Panes are Reinforced by Fine Wire of Large Mesh, and Set in Rubber Composition to Make Them Leak Proof

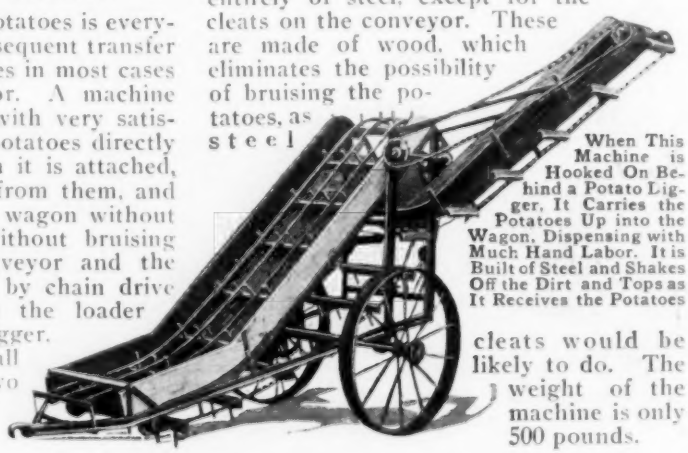
FATHER OF THE TYPEWRITER BORN 100 YEARS AGO

A movement to erect a shaft to the memory of Christopher Latham Sholes recalls that he died in 1890, hailed by many as the "Father of the Typewriter." Although the idea of the typewriter is at least two centuries old, a British patent being granted in 1714 for an "Artificial Machine for Impressing Letters," yet it seems certain that the American was responsible for the first commercially practical machine. Years of experience as an editor showed him the need of a "writing machine," and in 1867 he fashioned a crude affair of pine wood, glass, an old telegraph key, and carbon paper, that was held in the hand of the operator. The machine had other limitations, too, as it would print only the letter "W." Yet the construction was fundamentally good, and in 1874, a machine appeared on the market, to be improved year by year until the present commodity resulted.

As another item in her publicity campaign, Alaska will soon ship to the States 10,000 ft. of motion-picture film illustrating Alaskan life and scenery.

POTATO LOADER CARRIES CROP FROM DIGGER TO WAGON

Mechanical digging of potatoes is everyday practice, but their subsequent transfer to the wagon box continues in most cases to be done by hand labor. A machine that is coming into use with very satisfactory results takes the potatoes directly from the digger, to which it is attached, shakes the tops and dirt from them, and conveys them up into the wagon without manual assistance and without bruising them. The inclined conveyor and the shaker bars are operated by chain drive from the wheel hub as the loader moves along behind the digger. The tops, shaken loose, fall to the ground. Only two men are needed, one to run the digger and one on the wagon, the loader itself requiring no special attention. The machine is built entirely of steel, except for the cleats on the conveyor. These are made of wood, which eliminates the possibility of bruising the potatoes, as steel cleats would be likely to do. The weight of the machine is only 500 pounds.



When This Machine is Hooked On Behind a Potato Ligger, It Carries the Potatoes Up into the Wagon, Dispensing with Much Hand Labor. It is Built of Steel and Shakes Off the Dirt and Tops as It Receives the Potatoes

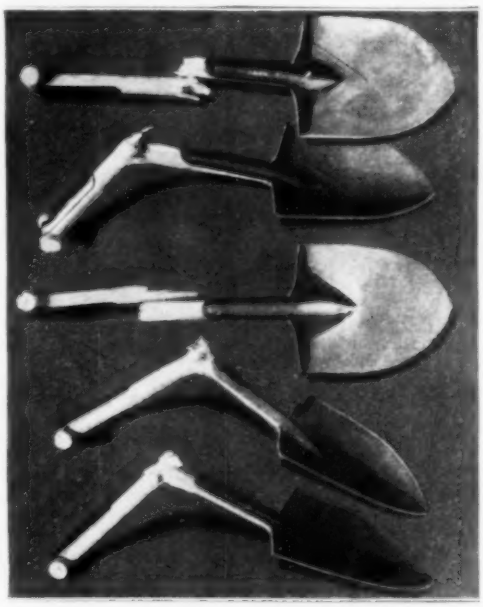
DODGING FREAKS AND FLAWS IN WOOD

How an Artificial Method of Wood Seasoning, Developed to Meet the Needs of War, Outdoes the Old Method of Weathering Stacks of Lumber

By BRANDON TRACY

ONE of the first official reports to the Department of Supply sent in from the Commander of the American Expeditionary Force in the Toul sector conveyed the following succinct information: ". . . . fourteen of the first thirty entrenching tools used proved defective. . . . ."

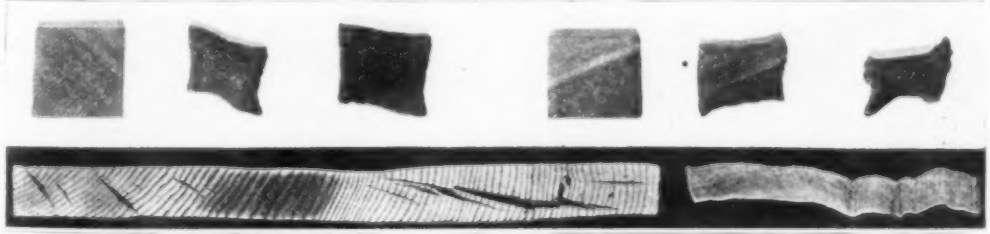
Stated briefly, when the soldiers carrying these short-handled spades attempted to use them for the purpose of "digging in," the handles broke! Since the entrenching tool finds its greatest utility at moments of life and death emergency — when burrowing in the earth is the only means of escaping the enemy's murderous enfilade — this was more than a serious fault. It was next door to criminal negligence on the part of the government which provides the defective implements. An investigation was started immediately.



Attempts to Season the Wood Rapidly Resulted in the Fracture of a Large Percentage of Entrenching-Tool Handles, Some of Which Broke Like This While Their Users were Literally Digging for Their Lives Amid a Storm of Machine-Gun Bullets

In those first months many other tools with long wooden handles failed to stand up in service. The Forest Products Laboratory of the United States Forest Service, which had the investigation in charge, found that the trouble lay entirely in the fact that the handles had been made from improperly oven-dried lumber. Manufacturers, face to face with an unprecedented demand for tool handles, had been compelled to give up using air-seasoned wood —little of any kind was left in the whole country — and accept an oven-dried product vastly inferior. This material, casehardened, checked, exploded, collapsed, and badly shrunk as it was, could do nothing but fail in the grand average of instances.

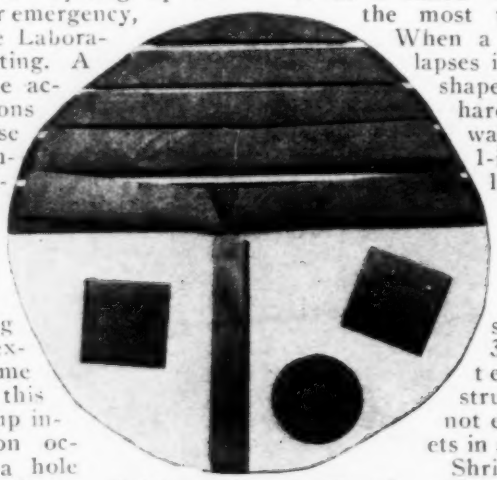
The Forest Products Laboratory, faced with the problem of working out a scheme for providing durable tool handles, joined this to two other similar problems, and solved the three at once. The other dilemmas had arisen in respect to spruce for airplanes and heavy oak stock for the rims of artillery wheels. There was no properly air-seasoned spruce or oak left in the United States; all had been gobbled up by the allies long before America joined them. The process of weathering takes from one to three years, depending on the size of



Utter Failure of the Fiber, Called "Collapse," and Caused by Improper Drying, is Shown in These Cross Sections. All the Upper Specimens Were Originally Four Inches Square, but Some Have Lost Surprisingly in Volume

the stick desired, so this was out of the question. Mother Nature cannot be speeded, even by war.

An even dozen quack formulas for drying lumber, which had sprung up like mushrooms in the war emergency, were tried out at the Laboratory, and found wanting. A glance at some of the accompanying illustrations will show what these means for baking lumber to dryness accomplished. When some of the moisture, imprisoned in the middle of a board, was heated to the vaporizing point it naturally expanded. Then, if some means of egress for this vapor did not show up instantly, an explosion occurred. This tore a hole through the lumber fibers, making the stick entirely useless.

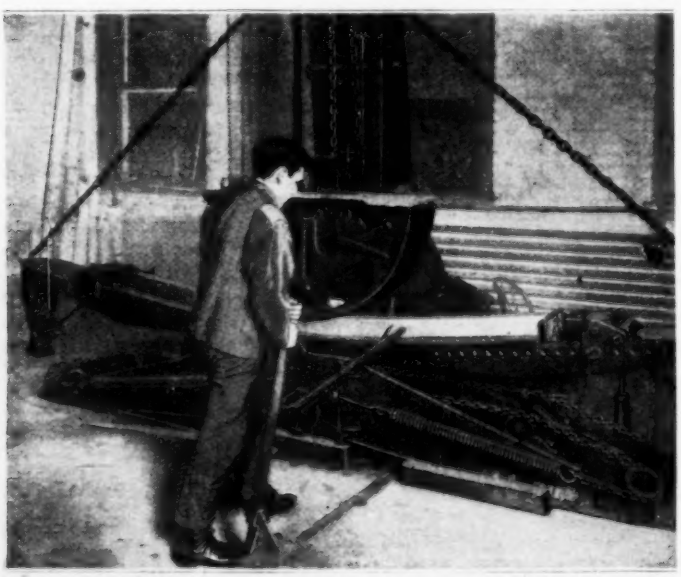


Shrinkage and Warping, Caused by Too Rapid Drying Outside While the Heart Retains Moisture, are Well Indicated in This Log-End View. The Center Stick has Wholly Failed at the Heart

Another mysterious flaw that developed is known as casehardening. Afflicted in this way, a stick warps so that it is concave on one side. This, of course, is caused by an outside drying while the heart still is wet; a tension, the nature of which still is a mystery to even wood specialists, develops which pulls the stick all out of shape and spoils its strength utterly.

What is called "collapse" is probably the most total failure of all. When a plank of wood collapses it loses all its original shape, and seems to casehарden several different ways at once. A straight 1-in. board may look like a rumpled rug after this has happened. A great deal of the original volume is lost and so much of the strength with it, that 3-in. spruce sticks intended for airplane struts or I-beams could not even be used for pickets in a fence, after collapse.

Shrinkage and checking, which are the two main faults that show up in fine oak when improperly dried, simply are the results of taking a high percentage of moisture content away from wood too quickly. How this affects the use of the wood is demonstrated well by the process of steam-bending artillery wheel rims. The heavy stock is supposed to bend readily into a semicircle, and two of these semicircles of oak make a single rim. In practice, with the oven-dried product, between 70 and 80 per cent of these oak sticks broke instead of bending. The loss in money and time was enormous, and it looked as if steel or some other material would have to be tried out in the manufacture of wheels.



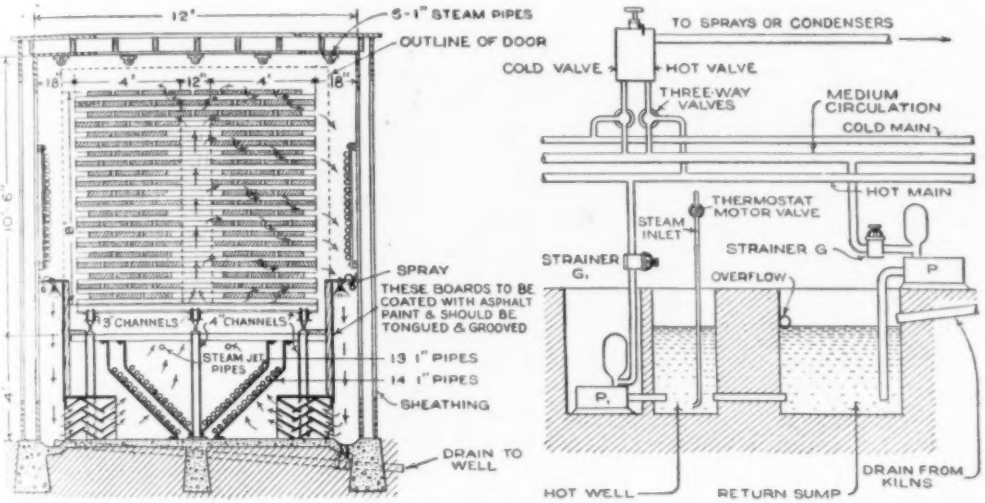
Bending an Oak Stick for the Wood Rim of an Artillery Wheel, the Wood First being Steamed in a Chamber or Soaked in Boiling Water: Seventy Per Cent of These Sticks Broke before the New Kiln was Used

A forest-products expert in charge of the department of timber physics solved the difficulty. He invented a water-spray, humidity-regulated dry kiln for use in seasoning lumber that not only has proved to be far better than any of the

other kiln methods, but also that actually turns out far better results with most lumber than regular standard air seasoning. In from 10 to 20 days in the kiln, better Sitka spruce for airplanes, better northern oak for artillery rims, and better Douglas fir for tool handles is turned out by his new kiln than ever had been available previously.

The chief feature of this new kiln lies in the fact that the air that passes down through the lumber pile first has been through a water spray that has given it exactly the humidity desired. To the layman any humidity at all in a dry kiln sounds queer, but it was exactly in this point that the new device surpassed all others. When lumber with a green-wood moisture content of 40 per cent is put in this kiln, the spray provides 40 per cent humidity at the start. This is kept constant for a day, with the temperature and circulation of air regulated, and then the humidity of the air is dropped. Gradually the water is drawn from the lumber, and this occurs in such a way that the heart of the wood dries first. No collapse ever occurs, and the total of all the faults that do show up is less than 8 per cent of the total under the best of the old kiln systems, and 75 per cent of the total reached by the best air seasoning.

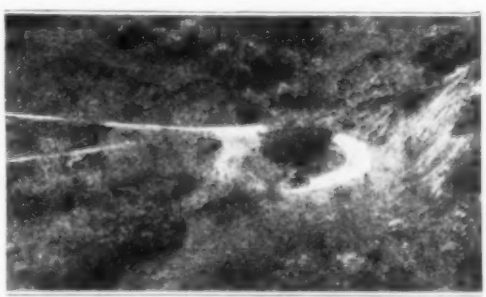
Now that the war is over, this kiln—patented in the name of the public—is at the disposal of anyone who desires to use it.



The Water Sprays through Which the Air Must Pass Before It Reaches the Lumber, as Seen at the Left, Are the Secret of This Dry Kiln's Success. The Right-Hand Diagram Reveals the Method of Regulating the Humidity and Temperature as the Drying Process Progresses. The System, Invented by a Forest-Service Expert, Seasons Wood Thoroughly in 10 to 20 Days, with Results Better Than Air Seasoning

LOOP TURNS IMPROVE ROADS UP CATALINA'S MOUNTAINS

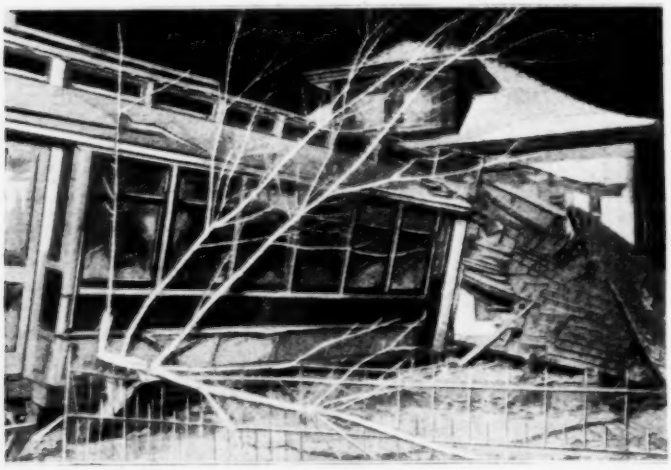
Roads that zigzag up steep mountain sides have a disconcerting way of suddenly reversing their direction as they stagger from one grade to another. On Santa Catalina Island, these reverse turns have been improved by adding to each of them a circular loop of roadway. This gives vehicles a chance to swing around into the new direction without coming to a stop; and it contributes a considerable factor of safety to the descent which may now be negotiated with less sudden application of the brakes.



The Junction Point of the Two Roads Seen at the Left Made an Awkward Turn for Vehicles Until the Circular Loop of Roadway was Added; Now the Curve is Easily Negotiated Going Up, and Is Safer Coming Down

STREET CAR ON A RAMPAGE ENTERS PRIVATE HOUSE

Out in Denver a common street car of an old and supposedly settled type became exhilarated by the keen mountain air to such a disorderly extent that it attempted to enter a private home on Tennyson Street. It passed the iron fence without trouble and crossed the yard, impatiently brushing aside trees and other obstacles. After demolishing the porch it was arrested by the inadequate size of the front door. The visitor was not hospitably received by the astonished family, who, as the door burst open, were confronted by the legend "Please Have Exact Fare Ready."



It Was a Denver Street Car That Committed This Atrocity. After Jumping Its Track on Tennyson Street, It Smashed through the Iron Fence, Knocked Down a Tree, Wrecked the Porch, and Thrust Open the Front Door of This Private Home

NEW BATTLESHIP "TENNESSEE" IS AMERICA'S LARGEST

The American superdreadnaught "Tennessee," recently launched at the Brooklyn navy yard, is the largest battle cruiser, in point of tonnage, ever built in the United States. Its displacement is 32,300 tons. Of the same class as the "Idaho," its armament, twelve 14-in. guns, fires a broadside of 17,508 lb. of projectiles with a range exceeding 20 miles. More than 60 per cent completed at its launching, the "Tennessee" is expected to take its place in the line early in 1920. It is the third American fighting ship of that name, and for the ceremony of its christening the public was admitted to the navy yard for the first time since April, 1917.

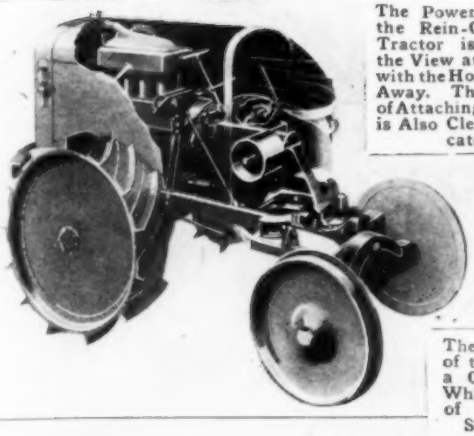
BARBED WIRE TO BE SALVAGED FROM BATTLE FIELDS

It has been estimated that 100,000 tons of barbed wire can be recovered from the battle fields of Flanders and northern France. As this material may command a price of perhaps $25 a ton, it seems that the British War Office Salvage Committee is wise in preparing an extensive reclamation program. The estimate appears very conservative, too, when it is known that America, alone, exported during the war more than 1,000,000 tons. The British committee is said to have ordered 40 outfits for this work, each unit carried in a motor truck and trailer. The tangled wire will be caught by a number of grappling hooks, and drawn by a steel cable and winch between two sets of rollers. The salvaged material will emerge from this process in the form of blocks weighing from 70 to 80 lb. each.

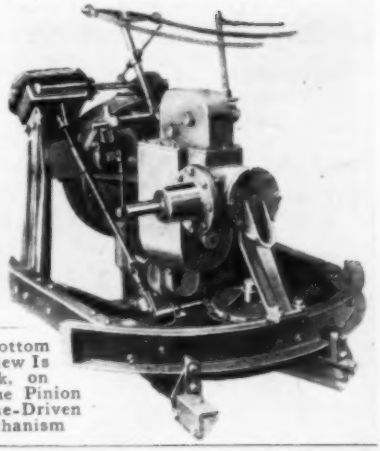
SMOKE BARRAGE THRILLS PUBLIC IN MIMIC WAR

In many of its public exhibitions of war material the government has displayed everything from a hand grenade

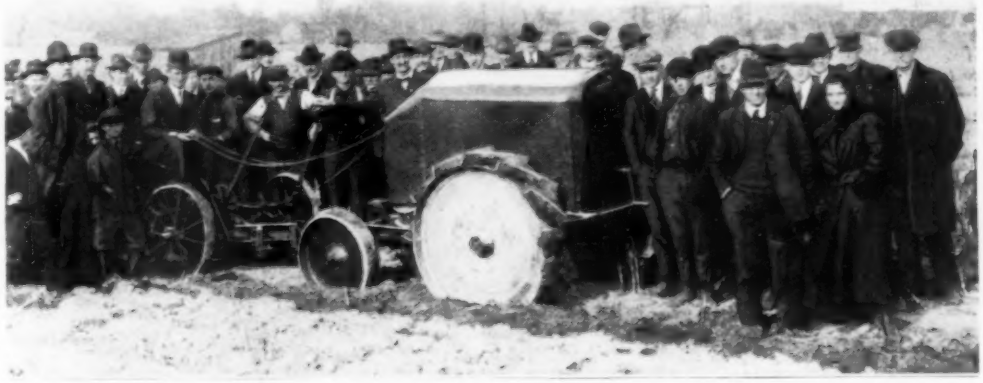
The Soldier is Demonstrating the Action of the Smoke-Screen Apparatus Used in Masking an Attack



The Power Plant of the Rein-Controlled Tractor is Seen in the View at the Left, with the Hood Broken Away. The Method of Attaching the Reins is Also Clearly Indicated



The Arc at the Bottom of the Right View Is a Curved Rack, on Which Runs the Pinion of the Engine-Driven Steering Mechanism



The Rein-Controlled Tractor in Demonstration: The Tractor Itself is Unoccupied, the Single Operator Sitting upon the Implement Which is being Hauled, and Doing All the Work of Starting, Steering, Stopping, Changing Speed, and Shifting Gears by Manipulating the Three Reins, Which, of Course, may be of Any Length

to a 12-in. howitzer or a tank. An attempt is often made to thrill the spectators with a simulation of battle conditions, too, as with the smoke-cloud apparatus which was used to mask an attack. The contrivance resembles the liquid fire and other units which are carried complete by a single soldier, in order to secure the greatest mobility in the use of these effective weapons.

NEW JOBS FOR ONE-ARMED MEN IN SIGNAL TOWERS

So many European railroad men have lost an arm during the war that it is now found necessary to assign them to jobs hitherto regarded as unsuitable. The signal tower in the railroad yard is a typical case. Here a treadle is so fitted to the big levers that the foot does the heavy work while the arm simply guides the movement.

IMPROVEMENTS IN REIN-DRIVE SYSTEM FOR FARM TRACTORS

Efforts to dispense with the extra man required for many tractor-farming operations have produced several mechanisms for performing with horse reins all of the operations necessary to control of the tractor. A 3,200-lb. farm tractor now being shown meets these conditions by letting the engine perform the steering operation through gearing from the motor cam shaft. Connection is made through two clutches actuated by a shaft with a crossbar, which is turned by pulling one rein or the other. The lower end of the same shaft, when both reins are pulled together, turns a ratcheted cam, throwing the main clutch alternately out and in. A third rein shifts the gears into first, second, neutral, and reverse, through a pair of cams, an indicator showing their position.

SAILING SHIP OF OLD BRINGS DYEWOOD FROM ARGENTINA

Reminiscent of the days when our grandfathers adventured in strange seas, the two-masted sailing ship "Valiere" was

Two-Masted Sailing Ship of the Old Style, the "Valiere," Recently Docked at New York with a Cargo of Dyewood from the Argentine

recently warped to its dock at Pier A, New York City. It brought from Buenos Aires a cargo of 3,035 pieces of wood of the red quebracho, Argentina's natural dye product, whose value, since 1914, has risen enormously. The journey took 57 days.

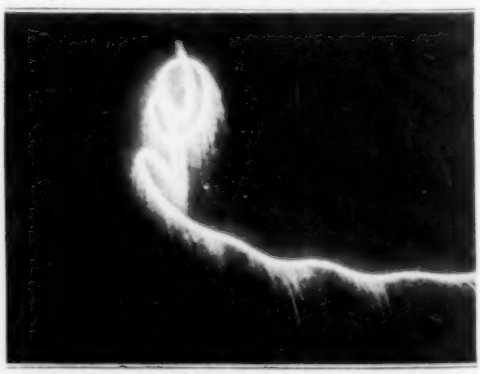
ELECTROMAGNETIC LAW SOLVES RIDDLE OF SOLAR TORNADOES

Cyclonic or whirling storms in the earth's atmosphere are governed by a well-known law of rotation, turning clockwise in the southern, and counterclockwise in the northern, hemisphere. Familiarity with this phenomenon has induced astronomers to study the rotational direction of the tornadolike gaseous disturbances on the surface of the sun, commonly known as sun spots, in order to discover possible similarities. Their method is interesting, as it is the result of a recent revelation that these sun spots are in reality gigantic rotating gaseous masses, in which electrically charged particles are whirled at high velocity. Hence the investigators study a vortex just like a simple electric coil, inspecting the end nearest the earth with the aid of a giant spectroscope to determine its polarity. Finding it a north or south pole, the scientists know at once, by rudimentary electromagnetic law, the direction of rotation of the electric particles, and consequently of the gaseous mass itself.

At this point the observers were puzzled. The solar tornadoes, unlike those of the earth, seemed to whirl in any direction they pleased, in both northern and southern hemispheres. The irregularity proved to be quite regular on further investigation, however, as the electric tornadoes, or spots, were found to travel almost invariably in pairs, of opposite polarity, and therefore of opposite rotational direction. But here the story stops abruptly, as no adequate explanation of this queer pairing has yet been offered.

FLARES ON NIGHT-STUNTING PLANE MAKE VIVID PICTURE

A queer record is left on an exposed photographic plate by an illuminated airplane performing evolutions in an inky sky. In the illustration, the flares carried by the plane have traced for the photographer a path like that of a drunken comet. The pilot has evidently done a number of stunts in dizzying succession.



This Looks Like the Trail of a Comet Gone Wrong. It Is Really the Path of an Airplane, Equipped with Flares and Flying in a Dark Sky

LANDSLIDES ON TWIN PEAKS KEEP ROAD WORKERS BUSY

Twin Peaks, San Francisco's matched pair of mountains, seem to be conspiring to make life miserable for the guardians of the beautiful concrete-asphalt highway to their summit. On one recent occasion 40 ft. of earth, 6 ft. deep, slipped out from under the road, leaving it to display surprising ability to maintain itself in mid-air. Again, a heavy concrete wall toppled over, carrying away 50 ft. of walk and roadway. Another slide wrecked 200 ft. of fence and piled itself a third of the way across the 25-ft. highway. This emulation of the Panama Canal's early depravity is assumed to result from seepage of water in the city's reservoir at the mountain's summit.

This Is the Spot Where the Earth Slid Out from Under the Road, Leaving a Bridge

One of the Twin Peaks Responsible for the Earth Slides is Seen Beyond the Highway

At This Point 200 Feet of Fence Went Down, and the Mountain Spilled Its Soil Out onto the Highway

FROZEN BLOCKS OF FISH FIND FAVOR IN NORWAY

Large factories have been erected in Norway for freezing fish without the use of ice. As the industry is practiced there, the catch of the fishing fleet is cleaned in the home harbor, thence shipped to the factory, where the fish are pressed into blocks and frozen by artificially produced low temperatures. It is stated that the first shipment of the blocks to Christiania was sold with such ease that the manufacturers are now eager to place their commodity on the export market.

MOTORCYCLIST CLAIMS RECORD LOAD FOR HIS MACHINE

An ardent motorcyclist recently decided that he would lay in next winter's firewood on a certain day, or know the reason why. The day came, and the mules who were to have done the heavy work ran away, smashed the wagon, and ruined the harness. However, the motorcyclist was resourceful. He borrowed a neighbor's smooth-running auto trailer, hitched it to his motorcycle, and brought home more than a ton of wood in one trip. Although an additional 250 lb. in the sidecar burdened the little motor with a total load of 4,275 lb., no appreciable difficulty was encountered in making the four-mile haul.

The Motorcycle Again Proved Itself the Emergency Machine When It Hauled This Man's Firewood

ARMY STUDIES AIR CURRENTS WITH SMALL BALLOONS

In modern warfare knowledge of the upper-air currents is vital to the success

PHOTO BY SIGNAL CORPS, U. S. A.

Rubber Sounding Balloon, Used for Exploring Upper-Air Currents, in Process of Inflation with Hydrogen: The Pivoted Arm, with Its Weight, Tells When It Is Time to Shut Off the Gas

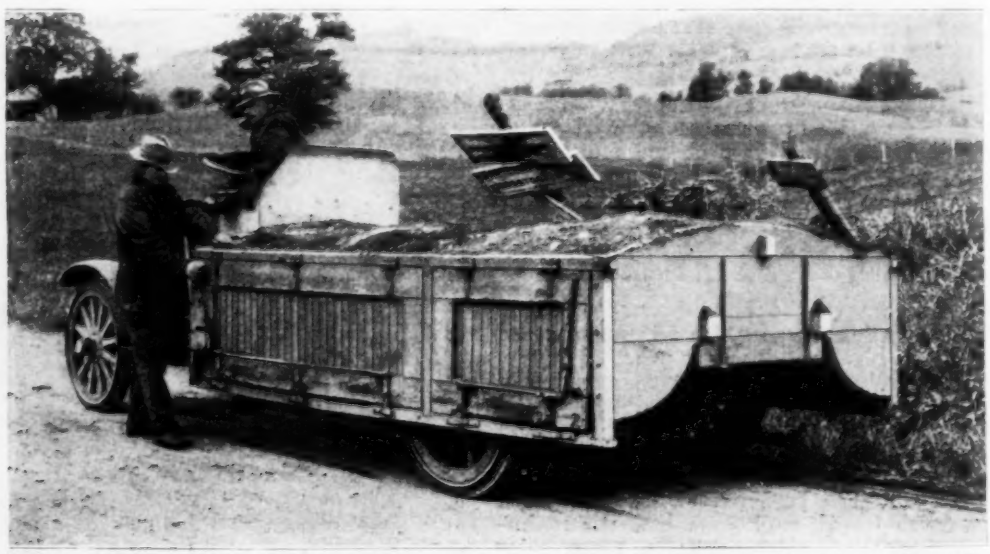
of either aerial or chemical operations. For sounding these atmospheric heights the army uses small spherical balloons of thin rubber. These are inflated with hydrogen gas to a diameter of 30 in., and their movements as they ascend are studied with a theodolite. The meteorological section of the Signal Corps made observations every four hours by this method.

ROUMANIA COUNTS THE COST OF WAR WITH GERMANY

Roumania suffered at the very beginning of the war by the closing of the Dardanelles and the consequent stopping of all essential imports. And in their administration of the Treaty of Bukharest the Germans did more to increase the ruin. Requisitions are said to have exceeded all stipulations; peace became more dreadful than war. Released now from German bondage, Roumania has been taking stock. As a typical item in her inventory it is reported that out of 2,000 locomotives before the war, Germany has robbed her of all but 15. She looks to American manufacturers for part of the 600 which she needs.

SIDE-DUMPING TRUCK BODIES FOR ROAD-BUILDING WORK

A builder of good roads in the vicinity of Windsor, Vt., is using a pair of two-ton motor trucks equipped with wide, low bodies, readily loaded by shovel labor. The sides, hinged at the top, open with a lever to allow any desired quantity of sand or gravel to escape. The body is partitioned into four compartments.



The Side Gates of This Truck, and Its Hopper-Shaped Compartments, Enable Road Builders to Dump Its Contents in Small or Large Quantities. The Low Body Makes Shovel Loading Easy

Here, at the Left, is Depicted the Type of Motor Scow Used by the Fish Commissioners for Dragging Seines in Inland Lakes. While at the Right, in the Folds of the Seine Itself, the Water is Boiling with the Struggles of Hundreds of Captured Fish

THREE TONS OF HARMFUL FISH REMOVED FROM RESORT LAKE

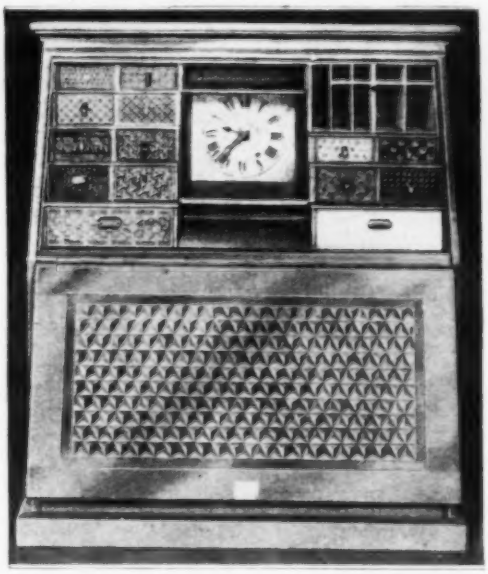
To preserve the game fish, menaced by the encroachments of coarser species, the waters of one of Illinois' famous resort lakes were netted this spring by members of the state fish commission. The long seines, operated from motor scows, brought in three tons of German carp, which were removed from the scene. Specimens weighing 55 lb. were included in the catch. In the process, however, some four tons of bass, northern pike, wall-eyes, and channel catfish were brought to light, a number of them very large. These were returned unharmed to the water, except for a few retained for the state hatcheries.

TEXAS OIL BORINGS EXAMINED FOR VALUABLE DEPOSITS

A geologist of the University of Texas is making one stone kill two birds by examining and recording the cores from oil borings throughout the state. He is doing this in the hope of eventually charting with reasonable accuracy the beds of potash and other minerals and salts which are believed to underlie many parts of Texas.

FIFTY-FIVE THOUSAND PIECES IN HISTORIC CABINET

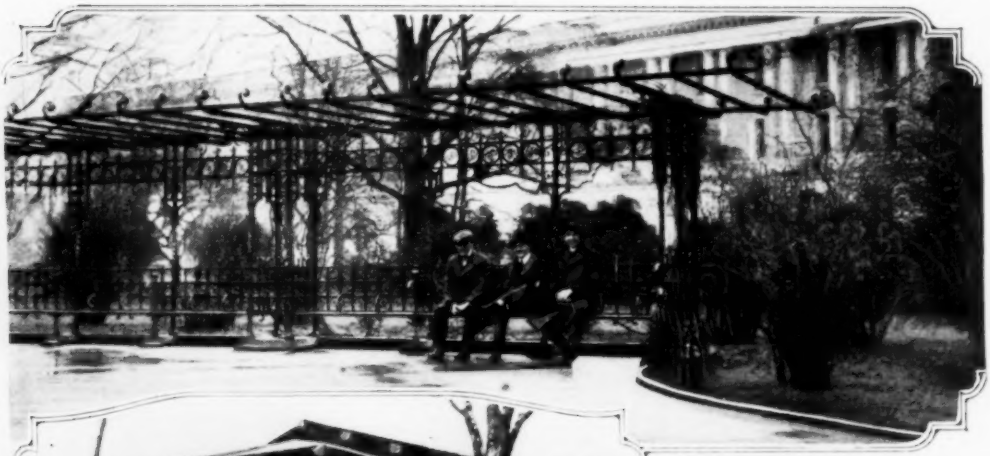
It is with a wholly justified pride that a veteran of the Civil War, Thaddeus Coffin, of Newcastle, Ind., who saw service in Capt. William McKinley's Ohio company, exhibits to his intimates a cabinet, made with his own hands, containing no less than 55,000 pieces of wood. Of these, more than 100 have historical value of their own, having been taken from



Cabinet Containing 55,000 Pieces of Wood, Put Together by a Veteran of the Civil War: It Has Specimens from the Charter Oak, the Battleship "Maine," the Keel of the "Constitution," and Many Other Famous Sources

famous American trees, as well as from ships and structures of celebrated memory. The inlays, 1/8 in. thick, are nearly all in their natural colors, the foliage of the "Charter Oak" in one panel being, however, tinted green. A tablet on the front of one of the drawers is done in the dots and dashes of the telegrapher's code, and, translated, tells something of the work of building the cabinet, which is 4 ft. 6 in. high and 3 ft. 4 in. wide.

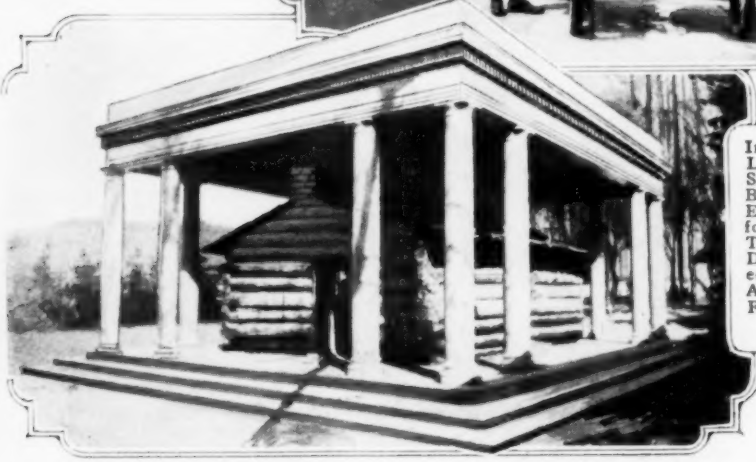
CIVIC FEATURES THAT PROMOTE THE COMFORT



Two of These Wrought-Iron Pergolas Grace the Grounds of the Capitol Building at Washington, One at the North and One at the South. Vines in Summer Shade the Ornamental Seats Beneath

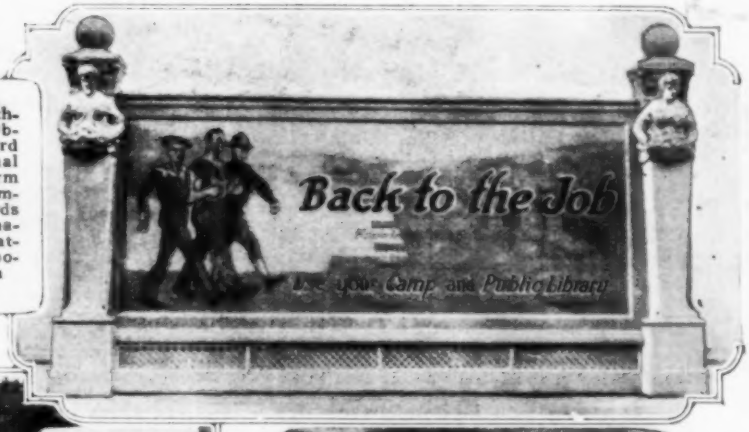
The Red Cross Chapter at El Paso, Texas, Occupies Its Own Log Cabin in the Central Plaza. Inside Are a Shop, a Tea Room, and a Large Fireplace. Decorations Are in Canary and Light Blue

South Pasadena, California, Finds That a Seven-Foot Strip of Concrete at Each Side of an Asphalt Pavement Prevents the Skidding of Motor Vehicles in Wet Weather. This Trial Strip on Fair Oaks Avenue Proved So Successful That All Future Paving will Use the Plan



In Temple Square, Salt Lake City, an Artistic Shelter in the Greek Style, Built of Wood, has been Erected as a Protection for an Old Log Cabin. This Humble but Historic Dwelling was Constructed by Brigham Young About 1847, and Was the First House Built in Utah by Mormon Pioneers

On the Theory That Nothing Artistic can be Objectionable, the Signboard Builders of the National Capital Proceed to Disarm Possible Criticism by Embellishing the Great Boards with Sculpture, Ornamental Moldings, and Lattices. This One is Opposite the Union Station



Some of Cincinnati's Fire Hydrants are Fitted with a Small Faucet and an Iron Bucket on a Long Chain, Whose Purpose is Indicated by the Sign

This Memorial to the Man Who First Raised the United States Flag in Southern California is Protected by Surrounding It with a Pool of Water in a Ten-Foot Concrete Basin, with an Outer Wall Two and One-Half Feet High

This Ancient Indian Shell Mound on the Shores of Tampa Bay has been Equipped by the City of St. Petersburg, Florida, as an Observation Tower, with a Flight of Stairs Up to the Platform

Guarding the Grave of an Indian Chief at Kitwanga, British Columbia, This Fierce-Looking Totem Is Visible from the Grand Trunk Pacific Railway. Its Success in Repelling Evil Spirits Is Apparent, for It has Stood Just So for Many Years

The Close-Up View of the Little $400 Biplane Shows the Motorcycle-Engine Power Plant, and the Simple Details of Construction Which Bring the Price within Everybody's Reach. The Other Picture Is of the Designer's First Flight in His Creation, Made along the Beach in the Face of a Stiff Sea Breeze

USE NATURE'S BARBED WIRE FOR SOUTHWEST FENCES

Ocotillo, a species of candlewood growing in profusion in the cactus country, has stems an inch in diameter, from 8 to 20 ft. long, and thickly studded with long, sharp thorns. By the simple expedient of placing the fence posts at closer intervals, Arizona ranchers are able to use these tough branches in lieu of barbed wire. It has proved so satisfactory that its use will be continued until wire prices go down.

Specimen of Ocotillo Plant, Whose Long, Thorny Branches Enable Arizona Cattle Men to Use Them as a Substitute for Barbed Wire

SMALL PLANE BUILT AT COST OF MOTORCYCLE

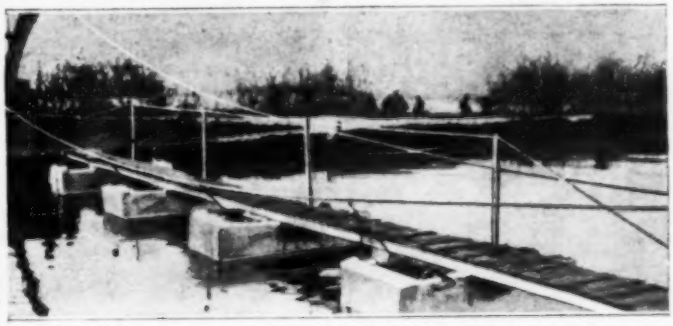
A cast-off motorcycle engine forms the nucleus of a surprisingly efficient little biplane that is said to weigh only 250 lb. During the war the designer has worked on aviation contracts, but for the last few months has devoted his talents to the construction of a small, low-priced plane intended to come well within the purchasing power of the average man. He seems to have succeeded, too, as his little ship, he says, can be duplicated for $350 or $400. His two-cylinder, 9 to 18-hp. engine pulls him over the tree tops at 35 to 40 miles an hour.

WELL-STOCKED FLOATING SHOP POPULAR WITH BRITISH NAVY

Men of the British navy who stood the monotonous four-year vigil at Scapa Flow, just north of Scotland, recall with gratitude the good ship "Borodino" which made life endurable during the long, tedious months. Formerly an ocean liner, the "Borodino" was taken over in the first months of the war and converted into a complete marine department store and recreation center. Here Jack Tar could buy all the little luxuries he values so much: fancy groceries, fresh meat and fish, wine, tobacco, new clothes, and sporting goods. In addition he enjoyed the use of an efficient laundry, a barber shop, a smoking room, and a billiard parlor. Every feature of the enterprise was enthusiastically supported by the sailors, and particularly by the Americans, who soon enjoyed a reputation as liberal spenders, and as sufferers from the worst cases of "sweet tooth" on record.

ARMY FOOTBRIDGE RESTS ON CANVAS FLOATS

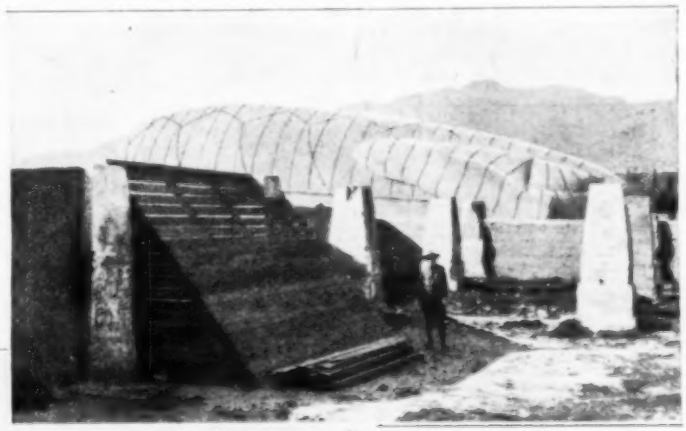
The innumerable canals and streams that cut certain sections of the western front made the construction of footbridges part of every battle order. Realizing the cost in lives of these crude little structures an American engineer devised a collapsible pontoon footbridge which, reports say, could be carried, 285 ft. to the truck load, and erected in short time. Erection is simple. Across the stream is stretched a heavy rope to which canvas floats, or boats, are attached at regular intervals of about 3 yd. From boat to boat are laid lengths of the "duckboard" so much used in trench warfare. A handrail is added and the bridge is complete. These little structures were always built under the most trying circumstances; thus, it is stated that the bridge in the illustration was finished under such heavy fire that the doughboys had to wait 26 hours before they were able to cross.



This Footbridge, across a Canal a Few Miles North of Verdun, is Built of Duckboards Resting on Canvas Floats, Adapting It to Construction under Fire

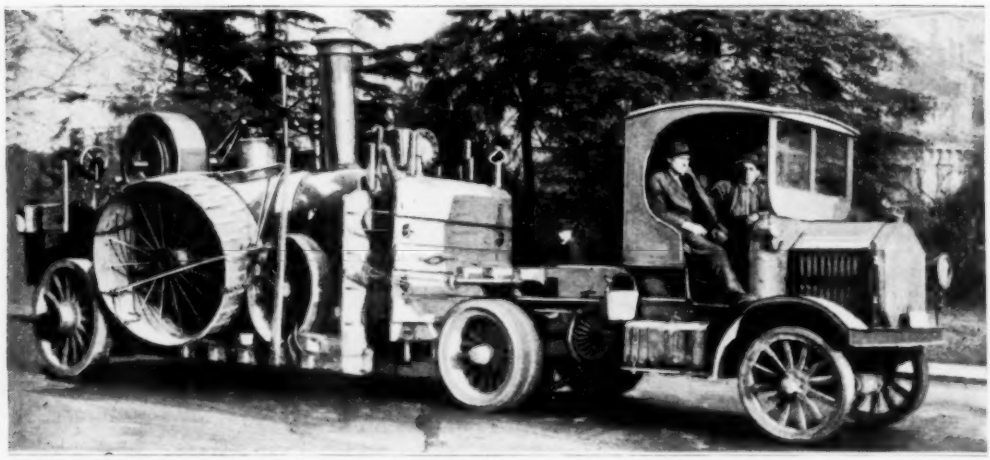
BALLOONS NEST IN RUINS OF OLD BUILDINGS

When fire destroyed several large buildings near an army balloon school, it was found that just enough of the foundations and basement remained to make the ruins useful. The first thing required of a nesting place for the big balloons is protection from the wind, which gets under them so easily and tears them from their moorings. The old foundations did this excellently; and with the removal of the débris and the erection of a few windbreaks they seem to be even more satisfactory than the usual excavations made at a considerable outlay of both money and time.



These Old Foundations are Now Supplemented by a Few Wooden Windbreaks, to Protect Army Balloons from the Sweep of the Wind

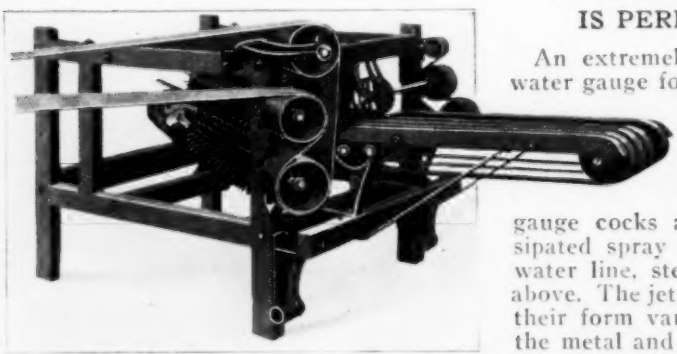
¶ Citizens of Strassburg, Alsace, are cheered by the return to their old nests of the famous storks which have avoided the city for the last five years.



This Shipyard Traction Engine Weighed 28,000 Pounds, and a Special Trailer was Made to Fit It, but an Ordinary Motor Truck Found No Trouble in Moving It in This Manner

THRESHER FOR BROOM CORN UNLIKE OTHER KINDS

In threshing broom corn it is the straw that is most important, instead of the grain. A threshing machine designed for handling this crop, therefore, has a feeding belt arranged to keep a tight hold on the stalks while it inserts the heads between spiked rollers. These, revolving in opposite directions, quickly strip the seeds off. The feed belt then deposits the straws on a table beyond the rollers. A hand-feed model has the rollers alone, the operator holding the stems.



Inside the Frame of the Machine may be Seen the Spiked Rollers for Threshing Broom Corn, Which are Driven in Opposite Directions by the Arrangement of the Belt on the Pulleys. Part of the Feeding Device is Seen at the Right

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The tail spin and the nose dive are said to have been responsible for the majority of the 106 fatalities at the three Texas training fields for airmen

FOURTEEN-TON ENGINE HAULED ON SPECIAL TRAILER

The modern maxim, that a motor truck can haul much more behind it than it can carry upon it, was well illustrated in the recent moving of a 28,000-lb. traction engine at Oakland, Calif. A special trailer was provided to accommodate the engine, and though several grades were encountered, no difficulty was experienced.

WATER GAUGE FOR BOILERS IS PERFORATED METAL

An extremely simple and unbreakable water gauge for boilers is described by an English engineer. A metal tube, replacing the usual glass in its mountings, has perforations 1/32 in., or less, in diameter. When the gauge cocks are opened, a rapidly dissipated spray of water issues below the water line, steam of course, coming out above. The jets are instantly distinguished, their form varying with the thickness of the metal and the size of the holes.

EXPERTS WRITE BIOGRAPHIES OF 150 VARIETIES OF WHEAT

The wheat-growing world should find much of interest in the census, now being compiled by the Department of Agriculture, of each variety of wheat grown in the United States. It is a bigger problem than it seems, too, as 150 varieties, known by 500 names, must be investigated and a complete history written of each.

MATERIAL SOLD AT DISCOUNT TO FOSTER HOME BUILDING

It is doubtful whether any slogan aims closer to the heart of American maladjustment than the familiar "Own Your Own Home." The movement is finding whole-hearted supporters everywhere; but in one city enthusiasm has crystallized into an organized campaign with this noteworthy feature—a discount card is granted by the local committee to every prospective builder who has broken ground and can prove his intention to begin construction immediately. These discount cards enable him to get reductions of 5 to 10 per cent on purchases of many sorts of material, a small saving perhaps, but often just enough to swing the balance from "building next year" to "building now."

EXHIBITS SHOW PUBLIC HOW GOVERNMENT SPENT MONEY

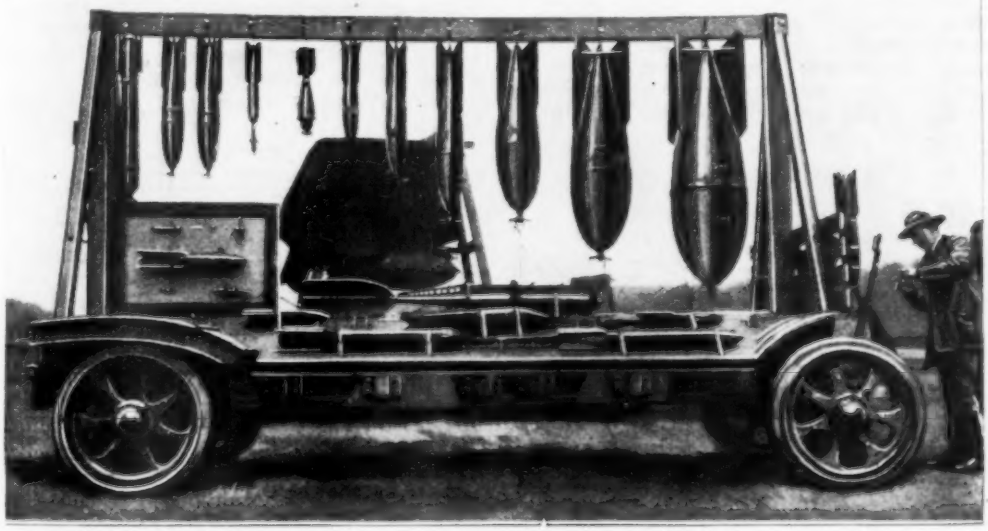
In gratitude to the loyal citizens who sacrificed and saved to buy Liberty bonds, the government is now exhibiting, in so far as possible, the engines of war that were bought with the money. Many of the exhibits proved the efficiency of the war-time censorship, by displaying ingenious Hun-destroying guns, projectors, and other contrivances that the public never dreamed of.

GROWING POPULATION TAXES CAPACITY OF SCHOOLS

Growing pains are to be expected in a healthy young nation like the United States. This discomfort is nowhere more

This Ill-Lighted Corridor Makes an Unsatisfactory Schoolroom, but It Is the Last Resort of the Authorities in a Typically Overcrowded American City

acute than in the public schools of our large cities, where there are often two youngsters for every desk. Temporary relief has been obtained in San Francisco, however, by holding classes in the corridors.



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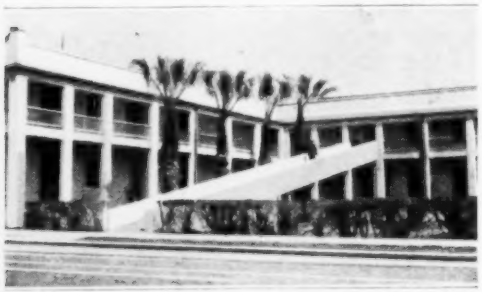
Little Packages Like These Made the Cities along the Rhine Very Unpopular during the Last Months of the War. This Collection of Aerial Bombs Used by the Various Allied Nations is Displayed by the Government in an Effort to Show the People Where All the Money Went. The Smallest Missile Weighs 27 Pounds; the Largest, on the Right, Weighs 1,100 Pounds

STRETCHER CASES CARRIED UP INCLINE IN COMFORT

When the ambulance draws up before a certain midwestern hospital to discharge



Stretcher Cases are Carried up This Incline, without Jolting or Other Discomfort, to the Receiving Room on the Second Floor

its sufferers, the stretcher bearers are faced by a gently sloping runway, 150 ft. long, and built of reinforced concrete. Up this easy incline they carry the patient, without the usual jolting and tipping, to the receiving room on the second floor. In addition to this constant prevention of pain and discomfort, the runway has also proved a blessing to convalescents, who are easily rolled up and down on their wheel chairs.

AUTOMOBILE KILLS LIONESS ON ROAD IN AFRICA

Out of Africa comes a thrilling story of a lioness who engaged a six-cylinder car in combat, on a lonely brush road at night, and was worsted. The car was proceeding peaceably toward Nairobi when its lights suddenly caught the glare of a pair of eyes. The startled driver opened the throttle. As the car jumped to a 40-mile gait the animal leaped in front of it. When the driver looked back, after the shock, and saw the huge beast lying growling in the road, he reversed, and the wheels finished the unpremeditated task they had started. The lioness lay still. In the car's radiator was a slight dent—its only injury.

BY COURTESY OF THE SKETCH, LONDON

The Lioness was Killed When a Six-Cylinder Car Ran Her Down on an East African Road at Night. The Driver Finished the Job by Backing over Her

ROOF OF TAXIDERMIST'S SHOP PILED HIGH WITH ANTLERS

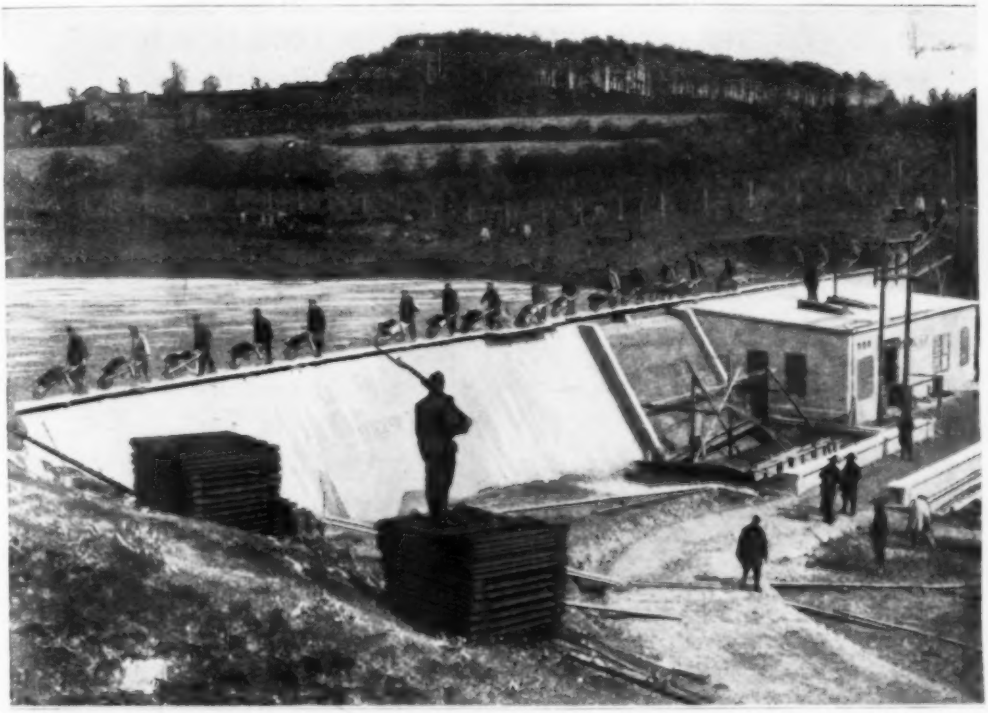
A Wyoming taxidermist, who conducts his business in a quaint old log cabin on a hillside overlooking the town, manages to attract a good deal of interest, and probably considerable trade, by means of his unusual advertising display. He has piled on the roof of his cabin a collection

Approximately 200 Antlers Make Up This Unusual Advertising Display on the Roof of a Taxidermist's Workshop. As the Cabin Is on a Hillside above the Town, the Collection Draws Much Attention

of nearly 200 antlers, large and small, which he has accumulated in building up a reputation as an expert mounter of heads.

DENDROGRAPH RECORDS CHANGE IN SIZE OF TREE TRUNKS

To record the daily and seasonal changes in size of tree trunks a group of botanists have fashioned an instrument called the dendrograph. In principle, changes in circumference are transmitted through a belt of hinged wooden blocks to a recording pen point on a revolving drum. In application, however, the apparatus is made in two forms. In the first, a number of plungers in radial contact with the belt carry on their outer ends an encircling wire. As the tree varies in girth the wire actuates the pen point. In the other type, a yoke with four points of contact embraces the belt, taking the place of the rods and wire.



The German Prisoners along the Top of the Dam are Assisting in the Construction of One Unit of the American Water-Supply System at Brest, France. The Completed Plant Stores 16,000,000 Gallons and Has a Capacity of 4,000,000 Gallons a Day

BREST WATER SYSTEM FORMS MONUMENT TO YANK ENERGY

American resourcefulness was nowhere more heavily taxed during the war than in the construction of the great military camp at Brest, France. Water supply was a typical problem met, in a typical American way, by the construction of a complete modern supply system. Reservoirs in the hills, pumping stations, and pipe lines were designed and erected in the face of discouraging difficulties. Labor was cheap, however, as German prisoners were often a drug on the market.

RUSSIAN CHILDREN DO BETTER WITH AMERICAN FOOD

As a result of the food distributed by the American Red Cross among the children of 122 schools in Archangel and outlying districts of Russia, great improvement is reported in both attendance and work. In a little more than six weeks, 8,161 cans of milk, 7,341 lb. of crackers, 4,224 lb. of sugar, and 2,049 lb. of cocoa were consumed. The grateful children have sent toys and letters for their American cousins to Red Cross headquarters.

IOWA VICTORY-LOAN SIGN OF UNUSUAL BEAUTY

Designed by the local committee, a Victory-loan bulletin board of more than ordinary beauty was displayed at Charles City, Ia., during the late campaign. Its 26 by 21-ft. surface, flood-lighted at night, bore a huge "V," and in the center, the

Victory-Loan Bulletin Board, 26 by 21 Feet, Displayed at Charles City, Iowa, and Flood-Lighted at Night: The "V" Is Light Blue, the Lettering Black, on a White Ground

lines "If ye break faith . . ." from Lieutenant McCrae's famous war poem.

DETECTIVES NOW WEAR MASKS WHILE VIEWING CRIMINALS

Criminals of the more astute, and therefore more dangerous class, soon become familiar with the features of police-force members, greatly increasing the difficulties of crime abatement. A number of large cities have adopted the system of requiring plain-clothes policemen to wear face masks during the inspection of criminals or suspects. The detectives are thus safe from subsequent identification.

Detectives of St. Louis, Missouri, Now Wear Masks When They Examine Captured Criminals or Suspects, So the Underworld Denizens will Not Know Them the Next Time They See Them. Other Cities have Also Adopted the System

ADDRESSES INSIDE PACKAGES ADVISED FOR PARCEL POST

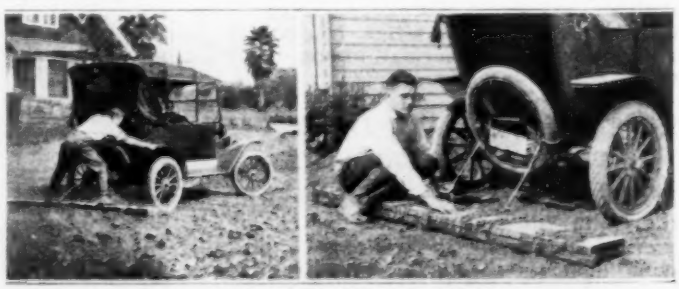
Users of the parcel post are now advised by government authorities to include in their packages a card bearing the name and address of both sender and addressee. In this way post-office officials will be able to forward an article even when the outside address is obliterated, or the wrapper entirely removed. The public is further reminded that the return to pre-war postal rates on first-class mail, effective July 1, 1919, will also apply to Canada, England, Scotland, Ireland, Wales, and the other countries to which domestic rates now apply.

HYPNOTIZED BY COMING SMASH, AIRMEN LOSE SENSE OF FEAR

Friends of those who have lost their lives in airplane accidents should find consolation in the stories of many who have had lucky "squeaks," in which they have resigned themselves to seemingly inevitable death, yet escaped to tell the tale. They often declare that their minds seemed hypnotized, even "frozen," by the impending disaster, and that the few seconds before the crash were filled, not with dismay, horror, or fear, but with a keen absorption in some trivial detail. Thus, one airman falls vertically to earth with his eyes riveted on a green patch of grass which he is very sorry to spoil; while another speculates on the probable duration and character of the noise caused by the coming smash-up.

GRADES HIS LAWN WITH DRAG PULLED BY SMALL AUTO

An ingenious house owner in Alhambra, Calif., wishing to prepare his large lawn at the least possible expense, made a drag by nailing two planks together and wrapping chain around them. This implement he hitched to his small touring car and hauled about the grounds, until all clods of earth were broken up and the ground thoroughly pulverized and leveled. This was accomplished with a total expenditure of five gallons of gasoline.



A Pair of Planks, Wrapped with Chain and Hitched to the Rear of a Small Touring Car, Made a Highly Efficient Lawn Drag, Leveling the Ground and Breaking Up the Clods as Well as Any More Pretentious Device, and Quite Economically

Innocent-Looking Packing Boxes Arranged to Conceal Fire Hydrants Just inside the Gates of a Strike-Bound Mill: A Length of Hose Attached to Each Hydrant Served as a Ready Repeller of Rioting Strikers

CONCEALED HYDRANTS USED TO QUELL RIOTING MOBS

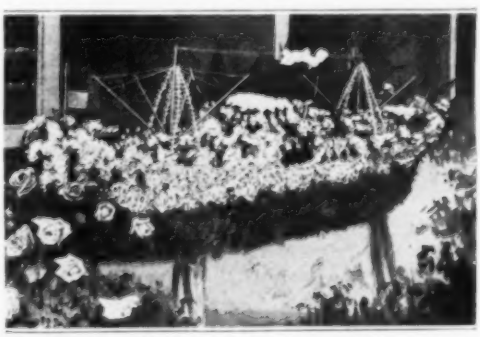
A solid stream of water, fire-hose size, has proven effective on more than one occasion for cooling the ardor of a rioting mob. In an eastern city, where a rather demonstrative strike was in progress, the guardians of the strike-bound mill kept a length of hose connected to each of three hydrants conveniently located inside the gates. Semicylindrical sections cut from old steel drums covered the hydrants, being easily tipped over when trouble arose. Later these were replaced at two hydrants by packing boxes open at back and bottom. The innocent appearance of the old boxes added greatly to their opportunity for service. In emergency a few moments sufficed to turn the key and start the flow of water, which is more potent for its purpose than a machine gun.

VISCOSITY SAID TO INDICATE STRENGTH OF GLUE

A series of experiments in the testing of glue have been taken to prove that, after all, the simplest test is the most reliable. The old idea that the strength of the substance could only be known through a chemical determination of the various ingredients is declared liable to error. The experimenter maintains that the binding strength may simply be expressed in terms of the viscosity, or in a general sense, that the slower it runs from the bottle the better the glue. In a scientific way, he measures this strength in terms of the ratio between the time required by a volume of glue dissolved in water to flow through a narrow tube, and the time required by a similar volume of pure water.

FLORAL SHIP IN FULL DETAIL HONORS DEPARTED WORKER

Floral anchors we have had since horticulture began, but a whole ship done in flowers is an unusually ambitious undertaking. Shipbuilders of a western yard not only assembled such an offering in tribute to a departed fellow worker, but reproduced in technical detail the type of ship upon which he had worked. Even the rigging occupied its correct position on the fragile structure.

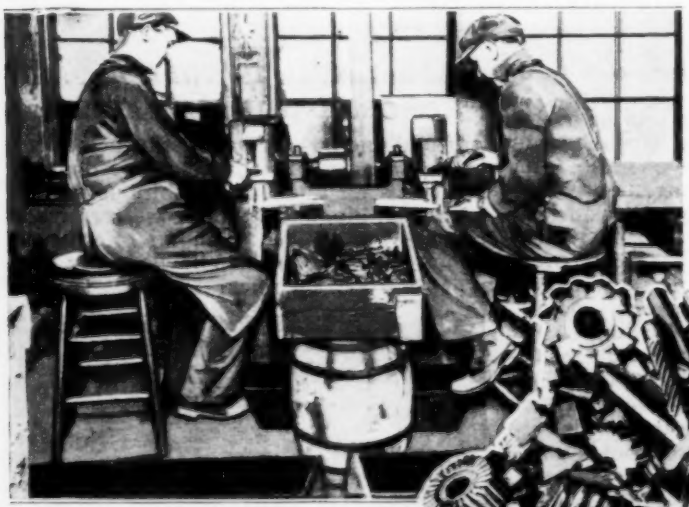


Floral Ship, Remarkably Correct in Technical Detail, Constructed by Shipbuilders of a Western Yard in Tribute to a Deceased Fellow Worker

¶ Holland's railroad interests are actively engaging in the construction of the new-style concrete rolling stock, in which only the wheels, axles, buffers, and couplings are made of steel.

RECLAIMING HIGH-SPEED STEEL SCRAP

Scrap high-speed steel has been given a definite value. New stock, in every way as good as the original, is being wrought by a new process from the waste left from tool making and the stub ends and broken parts of tools. Until recently this material was practically useless, and about 40 per cent of all the high-speed steel sold was ultimately thrown away. Many attempts made to weld the pieces together were without commercial success. The reclamation process, originated by a man possessed of much experience with the high-speed grades, faced the usual difficulties that hamper the commercial establishment of innovations. Since its demonstration of practicability, however, nearly a million pounds of scrap has been returned in the form of new high-speed steel. Its patrons, numbering more than 900, include two large railroads and many automobile manufacturers.



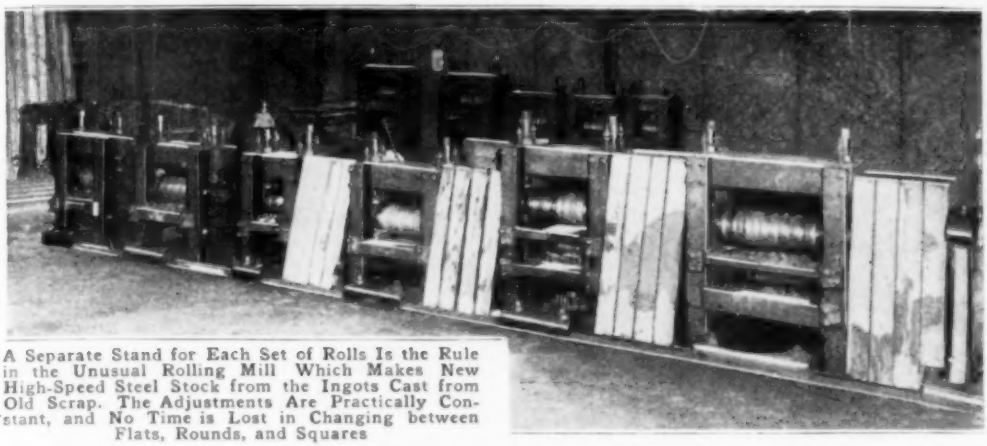
These Experts in High-Speed Steel Composition are Testing the Scrap and Identifying Its Brand by the Character of the Sparks It Emits When Pressed Against a Grinding Wheel

The primary difficulty was the variation in quality of the scrap from different steels, and the customers' insistence on reclaimed grades identical with their particular scrap. The fragments are received in miscellaneous lots of 25 to 100 lb. or more, a confused mass of all sorts and qualities. This seemingly perplexing problem proved really quite simple. The steels are identified by the character of the sparks they emit in contact with a grinding wheel, each brand giving forth its own colors, sizes, and shapes. The method is accurate, two or three experts coöperating in the determination.

When the new elements required for a specific result have been added, the steel is melted into ingots about 4 in. square and 2 ft. long. These are carefully annealed, reheated, and drawn and hammered into bars about 2 in. square and 6 ft. long. The last operation is rolling them into flats, rounds, and squares, the only specifications permitted the customers. The finished products are heat-treated in sealed tubes in special annealers, inspected, and shipped.

Even the rolling mills for these shapes, however, presented their peculiar problem. The comparatively limited tonnage, the variety of shapes, the necessary rigidity of the machines, all were objectionable points in the eyes of machinery men. This difficulty, too, the originators of the process themselves solved. In the mills they designed, each shape has its own machine unit, each set of rolls its own stand. The rolls are practically always in adjustment, so that high-speed steel can be used for the test bars, coming through practically to size, without the danger of mixing soft-steel specimens unwittingly with

This Is the Kind of Scrap That Comes to be Processed and Reclaimed—Broken Tools, Worn-Out Stubs, and Pieces of Waste



A Separate Stand for Each Set of Rolls Is the Rule in the Unusual Rolling Mill Which Makes New High-Speed Steel Stock from the Ingots Cast from Old Scrap. The Adjustments Are Practically Constant, and No Time is Lost in Changing between Flats, Rounds, and Squares

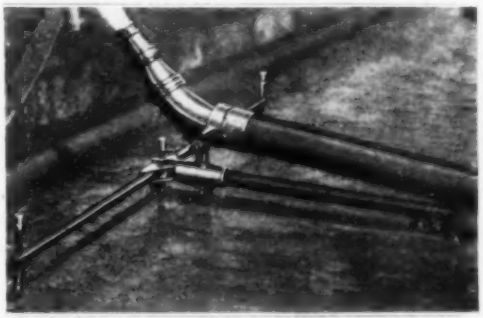
the product. The net result of all this care is a high-grade output of high-speed steel that gives no indication of its humble source in waste scrap.

LINES FULL OR DOTTED MADE WITH NEW DRAFTING PEN

By placing a grooved wheel between the points of a drafting pen, a new instrument has been produced, capable of drawing dotted lines, dots, and dashes, or in fact any kind of ruled mark, continuous or otherwise. The ruling wheel, 3/16 in. in diameter, slips onto a tiny spindle on the inside of one point of the pen, which enters a hole in the other point when the pen is closed. Notches in the periphery of the wheel determine the character of the line, several varieties being furnished. An adjustable forked guard on one point, resting against the T-square, prevents blotting.

NOZZLE ANCHOR DOES WORK OF FOUR FIREMEN

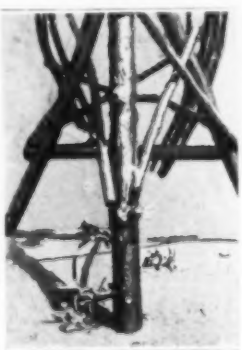
By using a "jack," or holder, four to six firemen can steady the nozzle of a powerful fire hose and deliver the stream at the desired spot. The continuous effort is fatiguing, however, and often keeps the men in dangerous positions for long periods. A simple 50-lb. anchor does the work just as well, besides releasing the firemen for duty elsewhere. The anchor is essentially a heavy three-point support for the nozzle.



The Stream from the Fire Hose is Held in Proper Direction by a Nozzle Anchor, Which Releases Half a Dozen Firemen for Duty Elsewhere

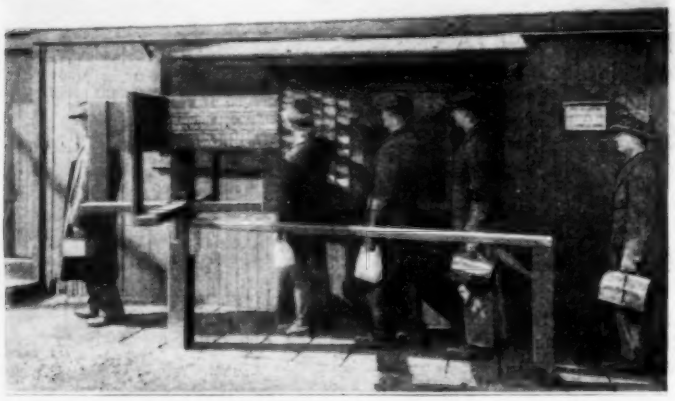
ONE LEG OF RUSTIC TABLE BEARS HEALTHY SPROUTS

Among the furnishings of a South Carolina home is a small willow table that is the talk of the neighborhood. Although it has been kept indoors and far from any moisture ever since it was built and properly painted, several months ago, one leg is now the proud parent of four leafy sprouts, which thrive in their strange surroundings.



TURNSTILE ADVISES CAUTION AS WORKERS CHECK IN

Innumerable methods have been devised by employers in an effort to educate



The Workers in One Railroad Yard are Greeted in Three Languages Each Morning by This Warning Turnstile Which Advises Carefulness throughout the Coming Day

the workman to an intelligent concern for his own safety. A turnstile in a busy railroad yard is perhaps the latest. As the worker takes his time card from the rack in the morning, he is confronted by a sign which warns him, in three languages, to "Be Careful; Avoid Injury to Yourself and Fellow Workmen."

STANDARD "NO PARKING" SIGN ADOPTED BY OREGON CITY

To discourage the promiscuous parking of automobiles, the city of Portland, Ore., has adopted a standard form of official sign. A heavy metal base bears a disk with the words "No Parking," and designating the reason for reserving the

Standard Form of "No Parking" Sign Used in Portland, Oregon: The Lettering Is Alike on All Except for the Designation of Reason for Reserving Space

space. In the center is the number of the city ordinance covering the situation.

PASSENGERS MAY WALK DOWN FUSELAGE OF TRI-PLANE

The Tarrant super-triplane, being assembled in the government shops at Farnborough, England, has the unusual wing spread of 141 ft., but is featured by the cigar-shaped fuselage, which is built of wood and strengthened by a system of girders resembling the cage mast of an American battleship. This construction eliminates the usual inside wiring, and will enable passengers to walk down the inside of the 85-ft. fuselage, from the seats at the front to the tail at the rear. The plane should easily carry 100 passengers, as it was originally intended to carry an enormous load of high explosives to Berlin. Power is supplied by six engines which give a speed range of 80 to 100 miles an hour.

SUN'S VARYING HEAT STUDIED FOR WEATHER FORECASTS

The little town of Calama, Chile, is located in one of the driest regions on the face of our globe. Day after day, almost without break throughout the year, the sun shines from a cloudless sky. Weather of this sort certainly has no appeal for the average man; yet two scientists from the Smithsonian Institution of Washington, D. C., find it ideal. As might be expected, their task is an unusual one, involving daily measurement of the heat reaching Calama from the sun, 93,000,000 miles away. Despite appearances, the work is thoroughly practical, as a striking correspondence has been discovered between the changing weather on our little planet and the fluctuating value of this solar radiation. In fact the two observers already telegraph their results each day to the government of Argentina, which makes them the basis of temperature forecasts for several days to come; and with such success that plans are now suggested for similar stations in other rainless portions of the earth, as in Australia, South Africa, Egypt, and India. By coördinating such widespread observations it is felt that remarkable results could be secured.

BALLOON PARADE IN ARMY AIR CIRCUS

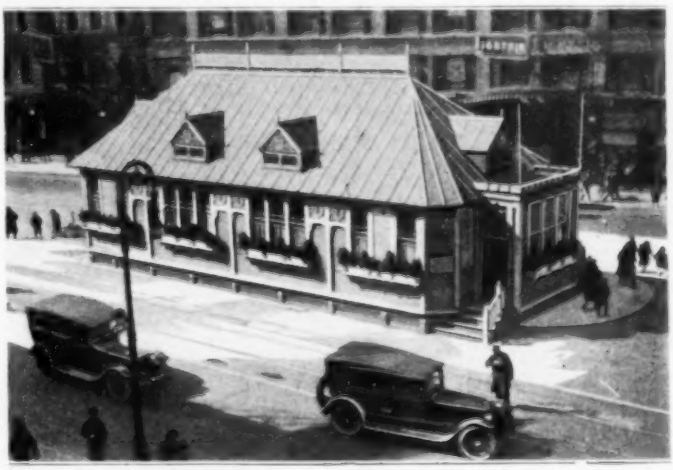
THE long-haired person who regularly assures us that there's nothing new under the sun is requested to find precedent for this balloon parade. Like the "Ponderous Pachyderms" of the old-fashioned street parade, the balloons passed in procession before the crowds at a great army air circus. Each of the big bags was kept in line by a motor truck and fifty soldiers.

GERMAN PROPAGANDA AIMED AT ARMIES IN OCCUPIED AREAS

Investigation has revealed that the German propaganda system continues to be a virulent menace, particularly in the zones of allied occupation. The chiefs in Berlin seem tireless in hatching new schemes for fomenting distrust and mutiny among the allied troops. As an example, an American officer recently discovered that our men were being supplied with views of ruined villages which bore the misstatement that the destruction was caused by French and British artillery fire. The sale was stopped and thousands of cards confiscated. It has also come to light, again and again, that the retreating German army left behind it, in many localities, a population carefully coached in hypocrisy and deceit for future dealings with the advancing allied armies.

RECREATION HUT IN HEART OF NEW YORK CITY

One K. of C. hut in New York City is located right in the heart of the Great White Way. Many returning Yanks are willing to declare it a great little location, too, after they've learned how very small their "thirty per" looks on Broadway.



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This K. of C. Hut on New York's Great White Way Welcomes Hundreds of Returning Overseas Men Every Day. Some Sort of Entertainment is Always Provided for the Boys

This Field is Covered with a First Year's Growth of Kudzu, the Forage Plant with Which a Florida Farmer has Achieved Such Remarkable Results. His Live Stock Seem to Prefer It to All Other Feeds, Even Browsing on Growth That has been Left on the Ground All Winter. In Addition, He Finds That It Enriches the Soil, and after the First Year Requires No Cultivation at All

KUDZU VALUABLE FORAGE PLANT

By ROBERT H. MOULTON

AMONG the many scientific discoveries brought about by the war is the fact that in kudzu, a leguminous plant, this country possesses one of the hardiest and most valuable forage plants known. Indeed, this remarkable vine seems destined to become one of the leading sources of wealth in certain sections of the United States in the future. Especially is this true of the southern states, where the slow development of agriculture has been due in large measure to the lack of good nutritious pastures and roughage that lasts throughout the entire year.

It Was a Luxurious Growth of Kudzu Vine Like That Pictured Which First Drew the Attention of the Florida Farmer to the Plant, although He Considered It a Nuisance at the Time

While kudzu is by no means a new plant, it was only a year or two ago that any extensive experiments were made with it, and the number of farms on which it was grown was insignificant. In fact, it appears not to have been studiously cultivated anywhere until a Florida man made the accidental discovery that his live stock seemed to prefer it to any other kind of forage plant, and that they waxed exceedingly fat upon it. As this was at a time when the high cost of feed forced many farmers to reduce the daily allowance of their animals, he hastened to plant a number of acres to kudzu, with the most satisfactory results.

It was not only as a feed for his farm animals that he discovered virtue in the plant, however. He found that, by reason of its power of extracting nitrogen from the air through the medium of the bacteria on its roots and adding this essential element to the soil, it quickly built up poor and worn-out land, making it fertile and productive. In this respect he believes it even superior to clover, alfalfa, and other leguminous plants. Last season he made the best corn ever grown in Florida, averaging 50 bushels to the acre, on land that the season before had been planted to kudzu, and this without any fertilizer whatever. What made the experiment more interesting was the fact that this land previously had never produced a good crop of any sort, being considered practically worthless.

All this came about as the result of a few vines which had been planted on the lawn of his home for ornamental purposes. Kudzu makes a beautiful vine, and is one of the fastest growers known, producing a dense shade in a very short time. On the lawn of this Florida man it was grown to cover a summer house. So rapid was its growth, in fact, that after the second year he grubbed it out, because the vines trailed all over the lawn, making it impossible to keep the growth confined to the summer house. The three roots so dug up were thrown on a trash pile in one corner of the yard, with the idea that, since it wanted to run on the ground, it would grow and cover the trash pile.

During the First Year a Full Crop of Corn may be Grown on the Same Land, as in the Illustration. Neither Crop will Interfere with the Other, and Both Require About the Same Attention

It not only did this the first season, but continued to reach out until it covered all the adjoining fences, finally reaching the barn lot, where the family horse was kept. According to its owner, the horse literally wore his mane off reaching under the bars of the fence for the vine, while the neighbors' cattle and hogs continually broke through the fence to get to it.

Becoming alarmed, lest the plant might be poisonous, the owner of the horse sent some of it to the Department of Agriculture for an opinion. On learning from this source that kudzu had no known poisonous properties, he began investigating, with the result that it was found to contain an average of 17 per cent of protein, in one instance the percentage being 19.82. The average percentage of protein in alfalfa is 14.3 per cent. On a measured space 30 feet square he cut during one season at the rate of 44 tons of cured hay in four cuttings. This, however, was an exceptionally favorable season, there being no late frosts, and the first cutting was ready May 1. The second cutting was made June 11, the third the last of July, and the fourth early in September.

While it is not claimed that kudzu will make four cuttings every season, nor yield 11 tons per acre at a cutting, it is believed that a safe estimate is from two to three cuttings, with a yield of from four

This Is the Kudzu Field Shown on the Opposite Page, but in the Second Season of Growth. Although Kudzu Is a Vine, It Is Anchored to the Ground Every Few Inches, and Is Consequently Easy to Cut and Handle. The Vine does Not Drag Ahead of the Mower Blades as with Similar Growths. Neither Is It Harmed by a Heavy Rain during the Period of Curing

to six tons per acre, anywhere that the plant may be grown under favorable circumstances; and experiments have proved that it is perfectly hardy all over the United States, enduring the winters as far north as Nova Scotia.

All the legumes, with the exception of kudzu, are more or less bad about dropping their leaves and shattering while curing and harvesting; and a heavy rain on them, or any of the grasses, hays, or fodders during the period of curing, means serious injury if not complete ruin. Kudzu, however, possesses none of these disadvantages. One planting lasts for many years and it may be cut or pastured at any time during the season, in north Florida, from about the middle of April until frost comes. And where there is a growth left on the ground, stock will feed on it all winter. Stock, in fact, have been known to eat the dead leaves and vines which have lain out and weathered until March, when it was hauled in for bedding, in preference to the best hay that could be bought. Its roots penetrate the soil deeply, for which reason they remain green and full of life during the entire growing season. Accordingly, the hay can be cut at any time when weather conditions are suitable for curing hay, as kudzu is not injured by waiting for good weather as other hay crops are. In fact, even if kudzu is thoroughly soaked during the curing period, it will afterward show little or no effect of the wetting.

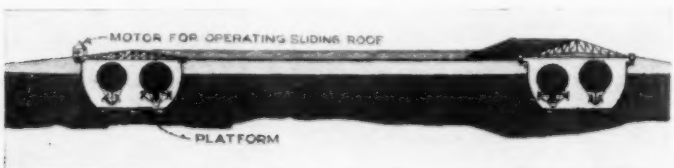
Most people might think that, because kudzu is a vine, it must be very difficult to cut and handle it as a hay crop. On the contrary, experience has shown that it is no more trouble to cut or handle than a heavy crop of red clover, Mexican clover, crab grass, or any other hay that makes a matted growth, while it is much easier to handle than either cow-pea or velvet-bean hay. Unlike the cow pea and velvet bean, kudzu is anchored to the ground every few inches, and so the vines cannot drag ahead of the mower blade, as they do in the case of the peas and beans.

Kudzu should be propagated by means of the rooted plants, for when these plants are removed to new fields they carry with them the bacteria, on the tubercles of their roots, which are necessary to inoculate the new soil in order to secure the best results. These roots live for many years. When the plant becomes well established it needs no further cultivation, being able to control native weeds and grasses without assistance.

The proper time for planting kudzu is two or three weeks in advance of corn planting, or a little earlier if one can get the ground ready. A full crop of corn may be grown on the same land during the first year by simply dropping the grains between the plants. Neither crop will interfere with the other and both need about the same attention. The ground, however, should be left smooth and level at the last cultivation to permit easy rooting of the vines or runners and subsequent mowing for hay. After the first year the kudzu will not need any cultivation at all, as the vines will run all over the ground the second season and take root at the joints.

PROPOSE RING-SHAPED SUBWAY AS HANGAR FOR AIRSHIPS

A subterranean airship hangar in the form of a huge ring was one of the German military plans which have been brought to light. The construction proposed took the form of an annular trench, with a light iron roof on rollers, pivoted at the center of the ring. The typical arrangement was a trench, 131 ft. wide at the top, tapering to a narrower bottom and lined with a thin coat of concrete. The depth depended on the type of airship to be housed. In a circle 607 ft. in diameter, such a trench would accommodate eight ships of average size. The rolling roof, as well as the sliding doors in it, were operated by an electric motor. An opening for launching could be made at any point in the circle, selection being influenced by the direction of the wind at the time. As a further refinement in this direction, a rotary movement for the bottom platform was also proposed, to bring any airship around to the desired point.



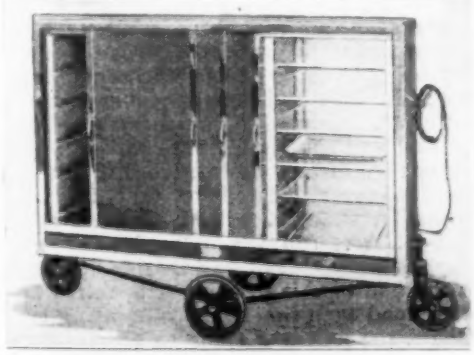
Cross-Sectional View of Annular Trench, a German Proposal for Housing Airships: The Roof, Revolving on Rollers, is Operated by the Electric Motor Seen at the Ground Level at the Left

AMERICAN LOOPS THE LOOP 300 CONSECUTIVE TIMES

The American lieutenant who looped the loop 300 consecutive times at Issoudun, France, stopped when he did only because his gasoline supply was exhausted. The record was made with a Morane monoplane at an average altitude of 2,000 ft., every loop being witnessed and recorded by watchers on the field. Their records show that the first hundred loops were made in 24½ minutes; the second hundred in 20½, and the third in exactly 20. After the 300th figure the plane glided smoothly to earth, not more than 100 ft. from the starting point. An examination was held and the plane found in perfect condition except for a loosening of the engine bolts.

PORTABLE TRAY RACK WARMS FOOD FOR PATIENTS

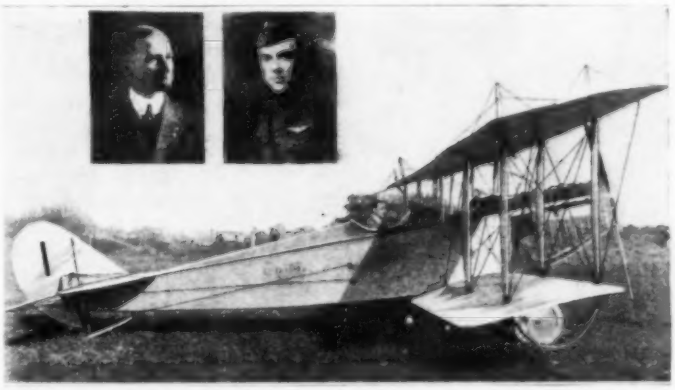
Food is served hot to patients in many hospitals by means of a tray rack that is heated by electric coils throughout its walls, and moved noiselessly through the wards on its rubber wheels. The rack, or truck, is about 5 ft. long and 4 ft. high, and holds 15 loaded trays. Close-fitting, sliding doors retain the heat in transit, while a plug and cord connection supplies current to the coils when a stop is made to distribute food. The top of the truck does duty, too, as a carrier for dirty dishes.



This Tray Rack is Rolled at Meal Times through the Hospital Wards. Heating Current is Turned On Whenever Stops are Made

PHYSICIAN MAKES VISITS IN AIRPLANE

The country doctor's traditional horse and buggy have been replaced for the first time by an airplane. The Nebraska physician, who is believed to be the first in the world to make professional calls in this way, purchased the plane, primarily, because of the impassable condition of the country roads. It is of the type used by the government for training purposes, and will be flown by a former air-service officer until the doctor himself becomes proficient in the care and operation of his machine.



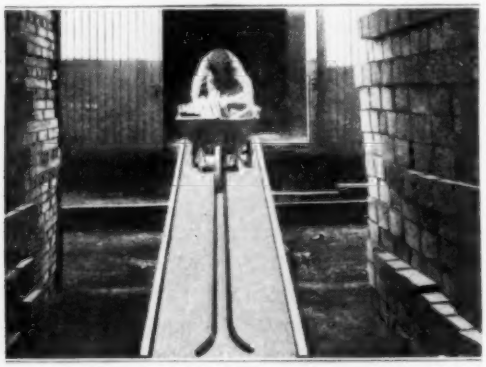
This Is the World's First Airplane to be Used by a Physician in Making Regular Professional Visits. The Inserted Portraits Are of the Doctor and His Neighbor, a Former Air-Service Officer, Who will Teach Him to Fly

TOWN QUICKENS CIVIC PRIDE BY SALVAGING OLD HOUSES

"A little town with a big idea" describes Wellington, an ambitious Kansas municipality, that has determined to rid itself of every unsightly property within the city limits. The townspeople realize that nothing deadens the neighborhood and civic pride more than the familiar run-down, ramshackle residences, sometimes on the best streets, which are commonly the product of the owner's neglect and the public's indifference. They have consequently resolved on a different policy for their town. They have raised a fund with which they will first buy these tumble-down properties, then remodel the houses, sod the lawns, and even lay out small gardens. When the property is again a thing of beauty and an asset to the community, it will be sold to some family which will take pride in the pretty home, and prevent another lapse into ugly disrepair.

STEEL RAILS GUIDE BARROWS DOWN SAFETY RUNWAY

A safety wheelbarrow runway has been adopted by one manufacturing company,



The Small Steel Rails Guide the Wheelbarrow down the Center of This Unloading Runway. Wooden Strips along Both Edges Give Additional Protection

to facilitate the unloading of its freight cars. Three heavy planks are battened together, side by side, to provide a broad, firm surface for the incline; while the safety feature is secured, in part by wooden strips that border both edges of the runway, but chiefly by two flanged steel rails that guide the barrow wheel down the center of the incline. For use when the descent becomes too steep, the company provides a similar, shorter section that may be linked to the end of the first, the junction being supported by a small wood trestle.

ANCIENT MADAGASCAR EGG IS RECORD BREAKER

The æpyornis was a rare old bird. He flapped his rudimentary wings several centuries ago, on the island of Madagascar, off the east coast of Africa, where he sometimes grew to a height of 12 ft., in appearance not unlike the modern ostrich. Among fossil remains on the island has been found this egg in the illustration.

The Egg of the Æpyornis, in the Center, is Computed to Be 150 Times as Large as That of the Hen, and Six Times the Size of an Ostrich Egg

It is about six times as large as that of the ostrich, with an armor-plate shell 1/8 in. thick. In circumference it measures 2 ft. 8 in. one way, and 2 ft. 2 in. the other.

AN AMERICAN STEAM SKIDDING MACHINE IN FRANCE

As a rule the lumber industry of France is characterized by the use of hand labor almost entirely. Logging is done with mule teams and two-wheeled carts, the sticks being hoisted into the carts by hand. Of course, before the war labor was much cheaper than machinery and power, so the methods were perfectly justifiable from the French point of view.

When the American army forestry troops entered the woodlands of that country to cut timber for our tremendous building projects, they carried with them American machinery of all kinds, even steam skidding engines, such as shown in the photo. The French foresters would not permit the use of such machines on

American Timber-Skidding Plant Erected in France by American Army Forestry Troops

steep hillsides, where the tearing away of soil would bring about erosion, but down in the sand-dunes country, south of Bordeaux, where the results of erosion could not be of greatly damaging nature, they were allowed, and the one shown herewith was installed. The manner of installing was similar to those in use in the big timber of our western coast country: three sheaves located so that the line formed a triangle, with a hauling cable of 1-in. steel running in toward the engine, and a rehaul of 5/8-in. cable attached to the end of this to carry it back for another load each time. Thus, by using two drums, the line was made to seesaw back and forth, bringing several logs at a load, and doing away with the need of working horses or mules on the sand dunes.

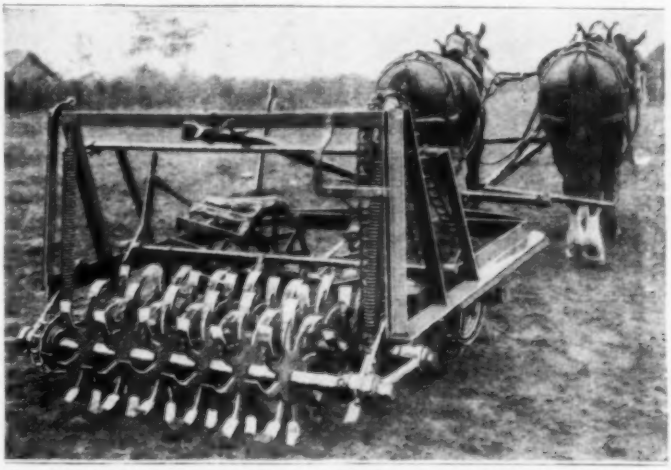
MYSTERIOUS VOLCANIC ACTION STUDIED BY METEOROLOGIST

Although the world has been spared serious volcanic disturbance during the last few years, interest in the subject has lately been reawakened by a discussion of the mysterious killing effect often observed when lava and ashes do not even touch the victim. A meteorologist suggests that the explosive expulsion of the lava from the crater generates a tornadolike wave of compression that speeds through the atmosphere in all directions, stifling animal heart and lung action, even disrupting buildings and trees. And in accordance with physical laws, which are easily verified by experiment, this wave of compression is accompanied by a flash of heat, the scientist maintains, sufficiently violent to destroy animal life, and ignite ships in near-by harbors.

Pasadena, Calif., is believed to be the only city in the United States in which every house is wired and connected for electric lighting.

CULTIVATOR AND HARROW COMBINED IN ONE

Performing in one operation the work of cultivating and harrowing, a new combination farm implement, originating in the state of Washington, cuts a five-foot strip of soil at each trip. The rotary cultivator blades, six on each of two shafts, are driven by a chain from the left-hand wheel, which has a broad traction surface. As the blades revolve forward, the machine runs easily, its weight resting largely upon the traction wheel.



By Revolving the Shovel Blades, the Inventor Makes This Machine a Combined Cultivator and Harrow. The Broad-Tread Wheel at the Left, Which Bears the Weight of the Machine, Runs the Blades by Chain Gear

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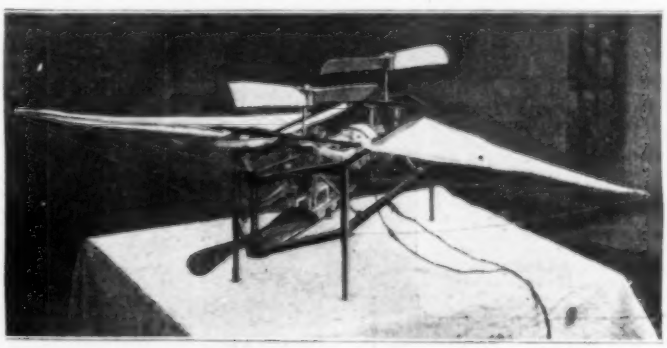
HELICOPTER AIRSHIPS STILL INTEREST INVENTORS

Experimental airship models, called helicopters, designed to rise from the ground by the action of horizontally revolving propellers, have actually flown years before the airplane was dreamed of. A toy model was demonstrated by two Frenchmen in 1784; another steam-driven machine is said to have flown across two large fields in 1842. And today, regardless of the airplane's remarkable development, many inventors are still busy with machines of this type. The designer of the model in the illustration has so much confidence in his ship that he plans to commence manufacture on a modest scale. It would be instructive to learn what happens when the motor stops in actual flight.

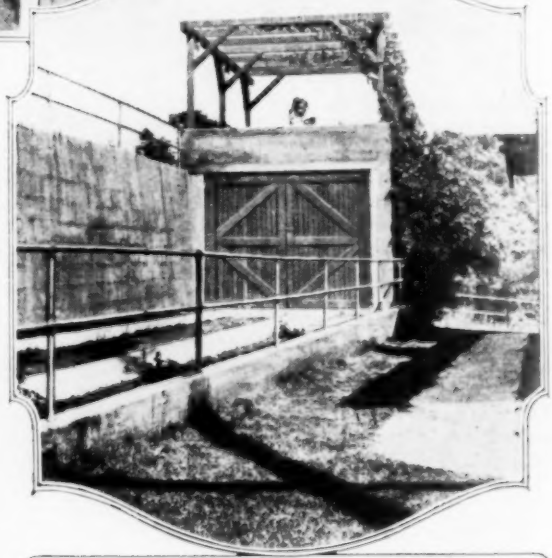


This Little Airship Has Propellers for Both Horizontal and Vertical Flight. The Adjustable Wings have been Added by the Inventor to Secure Stability

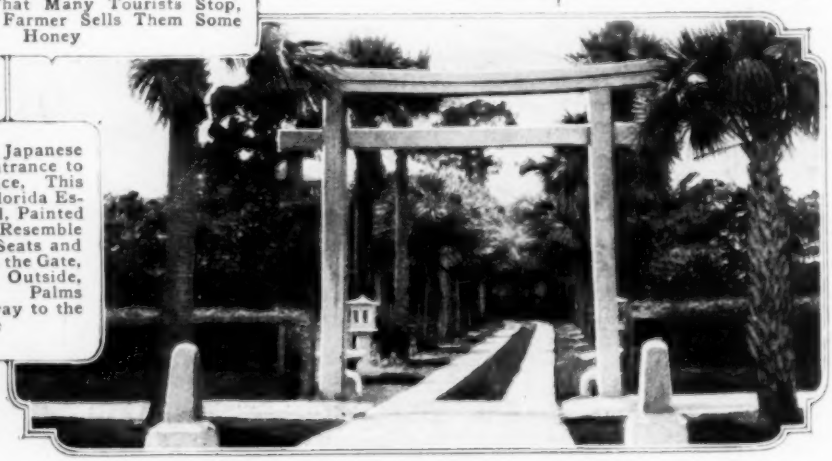
EXTERNAL FEATURES THAT MARK THE CHARACTER

The Big Double Bird Cage Is the Feature of This Pergola-and-Arbor Entrance to a Beautiful Summer Garden on a Southern California Estate. The Cage Construction Is Simple and Inexpensive, but Its Inmates —Canaries, Doves, and Linnets — Furnish Rich Entertainment

This Handsome Well, on a Dixie Highway Farm, Cost Its Owner About $65, but It Is So Attractive, Compared with Ordinary Farm Wells, That Many Tourists Stop, and Then the Farmer Sells Them Some Honey

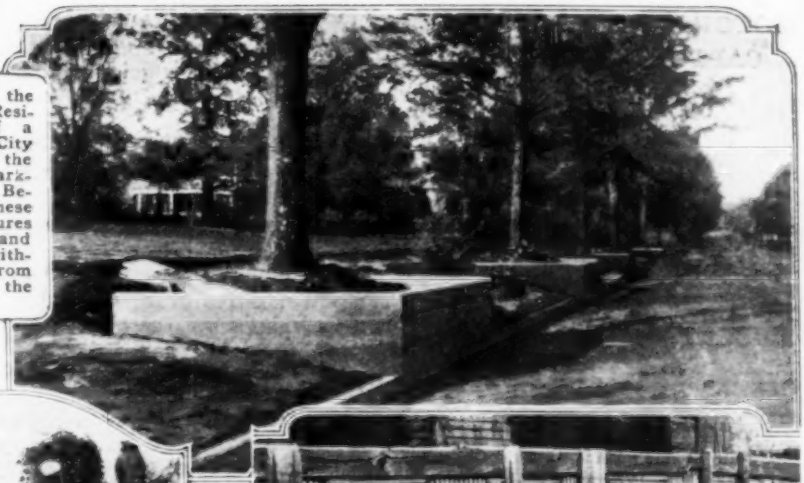


The Roof Garden on Top of This Concrete Garage, on a Los Angeles Hillside Lot, Has a Brown-Stained Pergola Hung with Rose and Ivy Vines, and a Floor Adorned with Potted Plants

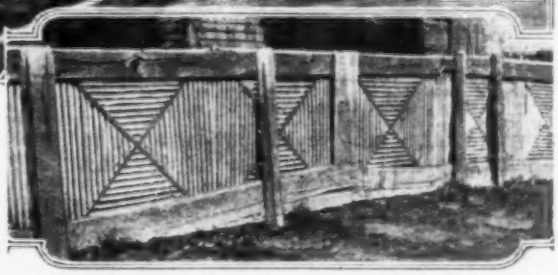


Modeled after a Japanese "Torii," or Entrance to a Sacred Place, This Gateway to a Florida Estate Is of Wood, Painted and Sanded to Resemble Cement. The Seats and Lanterns Inside the Gate, and the Posts Outside, Are Concrete. Palms Line the Pathway to the House

OF HOMES AND MAKE COMMUNITIES ATTRACTIVE



Regrading Some of the Streets in a Fine Residence Section of a North Carolina City Threatened to Kill the Trees along the Parking, as the Roots Became Exposed. These Concrete Inclosures Solved the Problem and Saved the Trees, without Detracting from the View down the Street



Discarded False Flooring from Street Cars Built This Peculiar Fence, Whose Owner was Actuated by Motives of Economy Rather Than Originality

A Large University Substituted This Arrangement for the Usual Unesthetic Danger Sign at Railroad Crossings. Lights in the Roof are Reflected on the Sign at Night. The Roof Is Moss Green and the Rest Dark Brown

The Naturalistic Logs of This Garden Entrance Are Concrete, Tinted, and So Is the Big Owl Perched Above, but the Latter Has Glass Eyes, Which Are Illuminated at Night. This Is a California Idea

The Porch Pillars Are the Novel Feature of This California Home. They Are of Dark-Red Brick with a Two-Inch Cement Trim, Which Extends About Two Inches. The Flower-Holder Openings, About 30 Inches High and 12 Square, Have Cement Shelves to Match, as Has Also the Coping of the Porch Wall

MOTOR "COP" HIDING IN BOILER CAPTURES MANY SPEEDERS

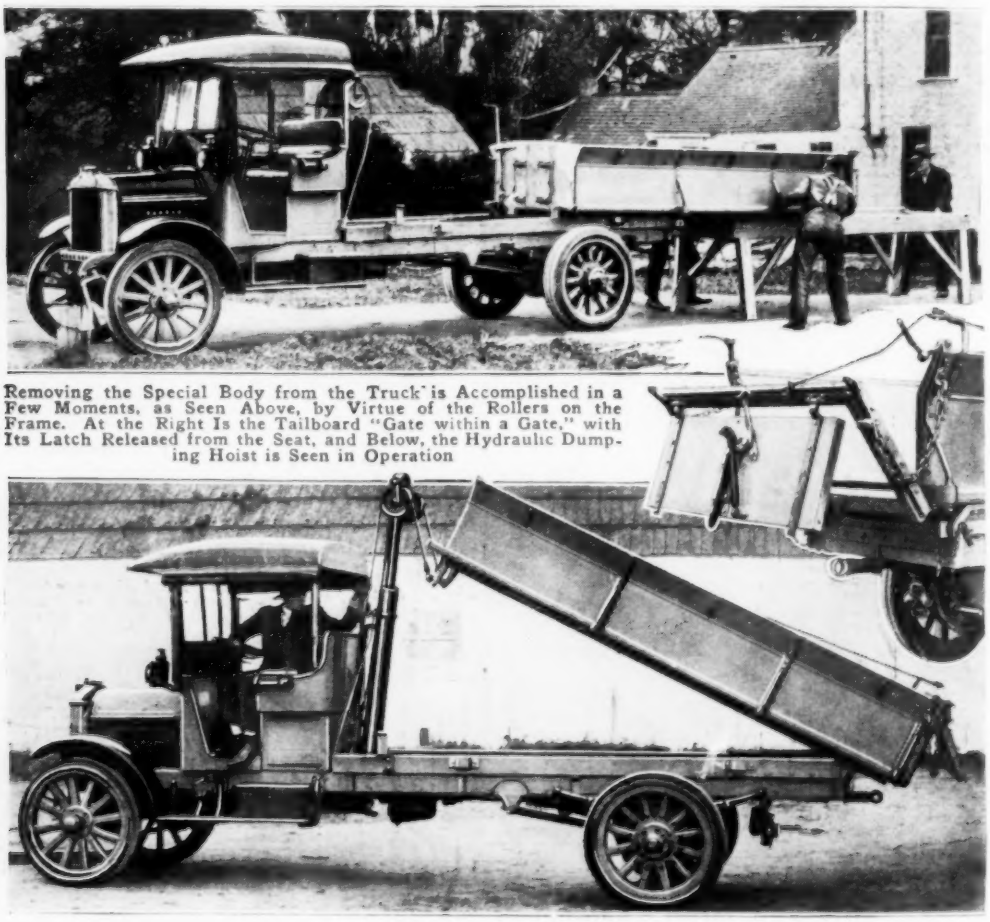
In one week, 202 speeding motorists on Mission Road, at Los Angeles, Calif., were

From His Lurking Place in This Old Steam Boiler, Accommodating Him and His Machine, the Motorcycle Policeman Sees the Highway without being Seen, and Catches Many Speeders

arrested by a motorcycle policeman who apparently materialized out of thin air. His well-chosen hiding place was a big abandoned boiler in a vacant lot, which afforded sufficient room for the machine as well as its rider.

BODY ADAPTED TO MANY USES IS SPECIAL TRUCK FEATURE

To perform effectively the miscellaneous tasks of a large estate, a motor truck was recently provided with a special body combining delivery and dumping types, and removable for carrying cumbersome loads on the flat bed. The zinc-plated steel lining is leak proof. The tail gate contains another gate, hinged at the top and released from the seat, for spreading gravel or sand. A hydraulic hoist raises the front end for dumping, or may be used with cables to assist heavy loading. Rollers on the frame, supporting the body, make it easily and quickly removable. A spring drawbar eliminates shock in hauling work.



Removing the Special Body from the Truck is Accomplished in a Few Moments, as Seen Above, by Virtue of the Rollers on the Frame. At the Right Is the Tailboard "Gate within a Gate," with Its Latch Released from the Seat, and Below, the Hydraulic Dumping Hoist is Seen in Operation

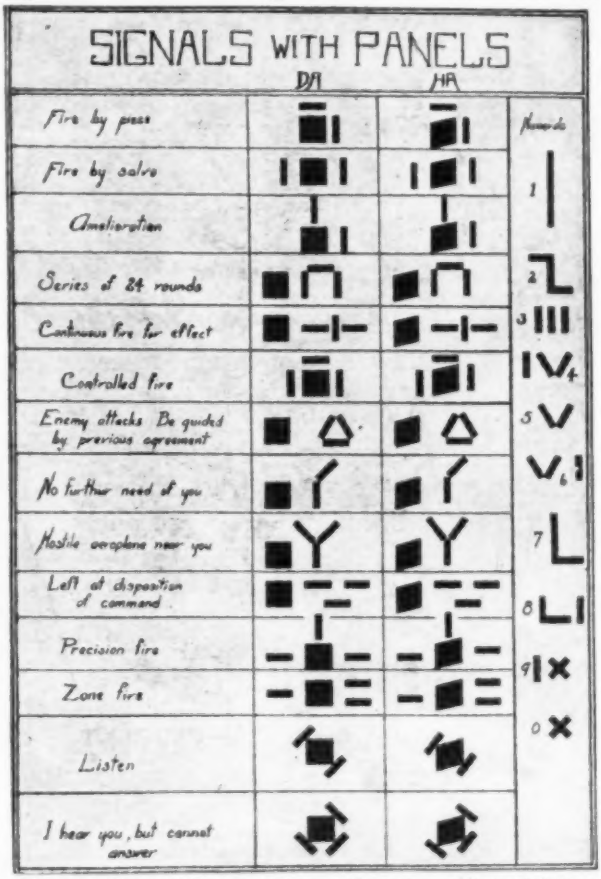
TRAINING THE AERIAL OBSERVER

By PERCIVAL E. JACKSON

Ex-Lieutenant, American Air Service, A. E. F.

THE American army had its choice, when America entered the war, between the French and British military systems then in vogue. Just as unity of command was then lacking, so too was there no uniformity of tactics in numerous important respects. Salient among these, were the differences between the French and British systems of artillery fire. The British, using a firing map divided into lettered and numbered divisions and subdivisions, covered with projectiles and shattered beyond repair the entire zone in which their particular objective was situated. The French, on the other hand, employing a firing map using the Lambert system of projections, accurately gauged each shot with respect to the particular target desired, lending to the work a finesse and skill that produced results quite as excellent as those obtained by the British, but with a much greater saving of ammunition. Naturally, the French method required a higher degree of skill in the direction of fire—and this was found most easily achieved by the use of aerial observation. With the French, in consequence, the aerial-observation squadrons were highly trained and developed, and when the Americans chose to use the French method of fire, they likewise borrowed their instructors and devices in order to bring their aerial observers to a high stage of efficiency.

In the training of observers, map reading, of course, is of prime importance. In action, the trained observer actually thinks in terms of the signs used on firing and other maps, so ability to read a map as easily as a printed page is the first thing required.



These Artillery-Adjustment Ground Panels are Made of White Canvas and are Displayed on a Dark Background, near the Guns, for Communication with the Adjusting Airplane. The Larger Panels Are 13 Feet Square and Serve to Identify the Battery Firing (Divisional or Heavy Artillery, etc.); the Smaller Are About 13 by 3 Feet and are Placed in Various Combinations to Indicate the Commands Given

In the illustration are shown some of the panels used on the ground by the batteries, in communicating with the observer in the plane. The observer sends his directions down by means of wireless. It was highly essential that both pilot and observer be thoroughly conversant with the panel signals, for often there would be enemy planes in the vicinity, and a more than momentary flash of the panels would reveal the location of the battery to the enemy. The panels were made of white canvas, so as to be easily seen against the dark background of the earth.

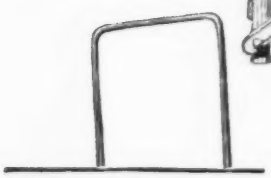
It is a fact that the first panel signal a pilot and observer became acquainted with was the one meaning "No further need of you"; the first display of which usually found the observer wirelessing back "Am going home," while the pilot made tracks for the aerodrome.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

No Need to Lean Out of the Window When Using the Clothesline Support Seen at the Left, Which Thereby Makes Apartment-House Life Easier and Safer

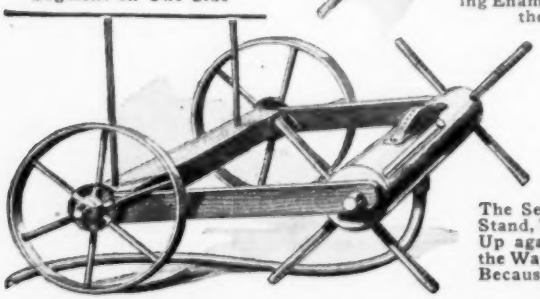
Home Gardeners will Appreciate This Combination of Turf Trimmer, Hoe, Trowel, and Weeder, the Separate Implements being Quickly Attachable to a Common Handle

The User Folds This Ironing Board Up without Stooping Over; a Skirt Slipped over the Free End Has Plenty of Space to Hang Unwrinkled; and Finished Articles are Hung Conveniently on the End



The Drum of This Hose Reel Forms the Lawn Sprinkler, by Virtue of the Perforated Segment on One Side

This Little Piano Lamp, When in Place at the Edge of the Top Board, Is Almost Invisible, being Enameled to Match the Piano



The Seat of This Telephone Stand, When Not in Use, Folds Up against the Table Out of the Way, Yet It Is Quite Solid Because of Its Ingenious Hinge Arrangement

Not Only are Collar and Cravat Combined in This Haberdashery Novelty, but the Collar Portion is Reversible

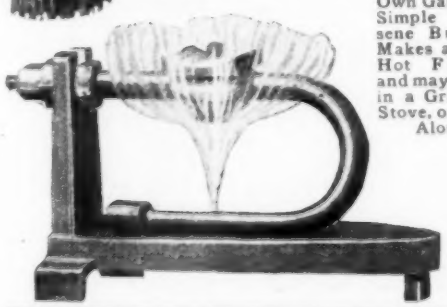
This Simple Device of Fine Spiral Springs and Tiny Pin Fasteners Provides Its Wearer with an Effective and Safe Holder for Pencils or Pens

An Ordinary Lamp Shade Becomes an Artistic Lantern When Draped with One of These Silk Covers

Latest of Automatic Dishwashers for the Home: This Machine, When Closed, Serves as a Kitchen Table and Has an Aluminum Top

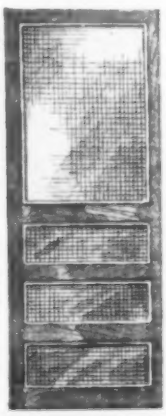
Individual Coffeepot, Creamer, and Sugar Bowl Nest Together in This Design, Taking Little Room on a Tray

This "Fountain" Mop Consists of an Annular Quart Tank That Slips over the Mop Handle, with a Valve to Regulate the Flow



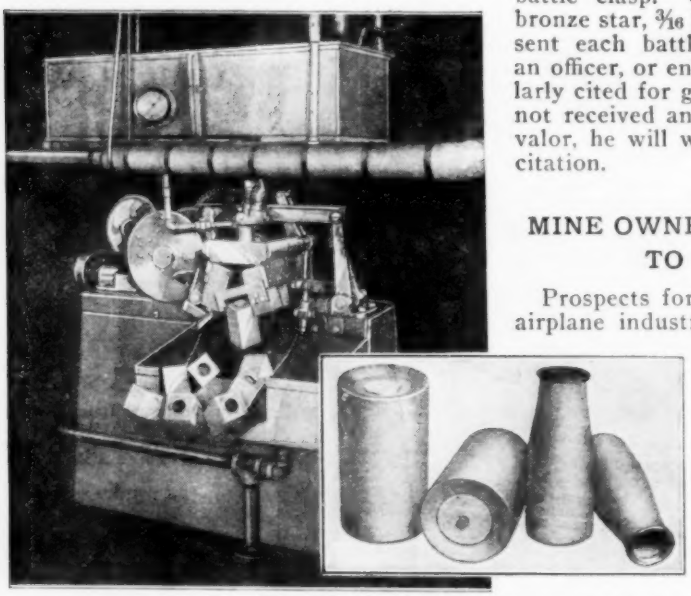
Generating Its Own Gas, This Simple Kerosene Burner Makes a Very Hot Flame, and may be Set in a Grate or Stove, or Used Alone

Here Is a Screen Door That Becomes a Storm Door in Winter by the Simple Process of Changing the Panels, for Which No Tools are Required



MAKES WOOD-PULP CONTAINERS IN HALF A MINUTE APIECE

There is a single material that effectively takes the place of glass, tin, and wood for the manufacture of containers of all kinds. That versatile substance is wood pulp. An automatic machine, recently developed, takes the raw pulp into its molds, manipulates it by compressed air, sterilizes it at 600° F., and throws out the finished container in 30 seconds. As the machine will handle any reasonable shape up to 40 cu. in. or so, it is not confined to bottles and cans, though that is probably its most useful field. Gears and cams are so arranged that one set operates a number of units in a row, 25 machines requiring a floor space 40 ft. long and 2 ft. wide, and turning out 24,000 finished articles in an eight-hour day.



The Automatic Machine at the Left is Seen Throwing Out Finished Containers, While Some of the Wood-Pulp Products are Illustrated at the Right

NEW VICTORY MEDAL ORDERED FOR AMERICAN ARMY

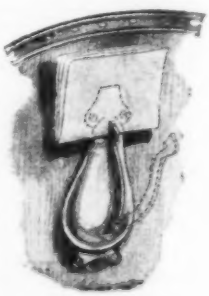
Official "Victory Medals" are to be awarded to all officers and enlisted men who served honorably on active duty with the American army at any time between the declaration of war on April 6, 1917, and the signing of the armistice on Nov. 11, 1918. The medal will have clasps, both for participation in the major operations of the war, and for service in any of five foreign countries, France, Italy, Siberia, Russia, or England. The latter clasp will be awarded only when the soldier has served overseas but is not entitled to the battle clasp. On the service ribbon a bronze star, 3/16 in. in diameter, will represent each battle clasp awarded. When an officer, or enlisted man, has been regularly cited for gallantry in action, but has not received any of the three medals for valor, he will wear a silver star for each citation.

MINE OWNERS BUY AIRPLANES TO CARRY ORE

Prospects for the continued life of the airplane industry seemed rather slim on the signing of the armistice, but recent exhibitions, and sales to sportsmen and commercial interests have done much to encourage the manufacturers. One of the most satisfactory orders has been that made by a delegation of mine owners for six planes to be used in transporting ore from their properties. As the order was placed only after searching investigation and study, on the part of these shrewd men of business, it seems to indicate a complete faith in the commercial practicality of the airplane.

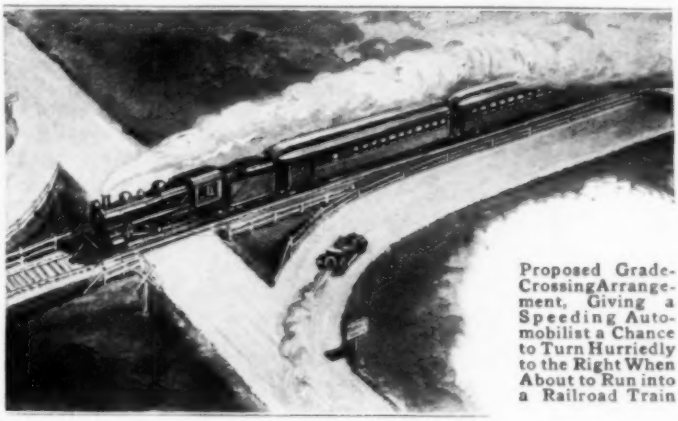
THEATERGOER'S HAT OR BAG HELD BY FOLDING HOOK

To hold the theatergoer's hat, bag, or program, an inventor has designed a small folding hook which is easily and quickly attached to the back of the theater chair. Normally it is held in a vertical slot by the pressure of a coil spring, preventing harm to a passing gown; but when wanted for use, it is easily pulled down into position by grasping the projecting finger grip. The mechanism is simple, consisting of only four parts, including the pear-shaped case and coil spring.



SAFETY TURNOUTS FOR ROADS NEW GRADE-CROSSING PLAN

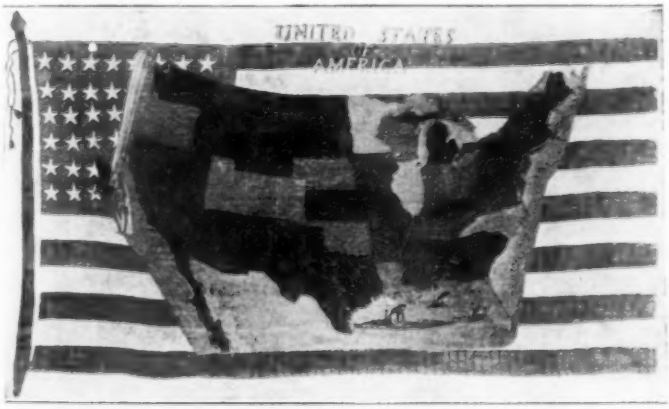
When the path of a speeding automobile is suddenly crossed by a railroad train, the driver generally turns the car to the right into the ditch, the fence, or whatever happens to border the highway at that point. Statistics show more casualties resulting from this natural action than from collision with the train itself. The proposal of a southern road commissioner calls for a strip of smooth roadway running alongside the railroad at each grade crossing for 100 yd. or more. It would join the right side of the highway in a broad curve, banked to prevent overturning of a suddenly swerved car. This simple and comparatively economical expedient, with the clearing of vision lines at least 100 yd. back from each approach, would, it is estimated, save a majority of the incautious drivers who now come to grief in their conflicts with locomotives.



Proposed Grade-Crossing Arrangement, Giving a Speeding Automobilist a Chance to Turn Hurriedly to the Right When About to Run into a Railroad Train

MECHANIC EMBROIDERS MAP OF THE UNITED STATES

After working in his spare time for two years, a mechanic and designer has completed an unusual task. Upon a strip of linen, 7½ ft. long and 4½ ft. wide, he has embroidered in colored silks a large American flag. In the center of the flag he has worked a map of the United States, with coastal waters, lakes, and rivers in light blue, state capitals in dark blue, and the states themselves in half the colors of the rainbow. The coasts are well protected by a battleship on the west and a small fleet in the Gulf of Mexico, all shown in careful detail.



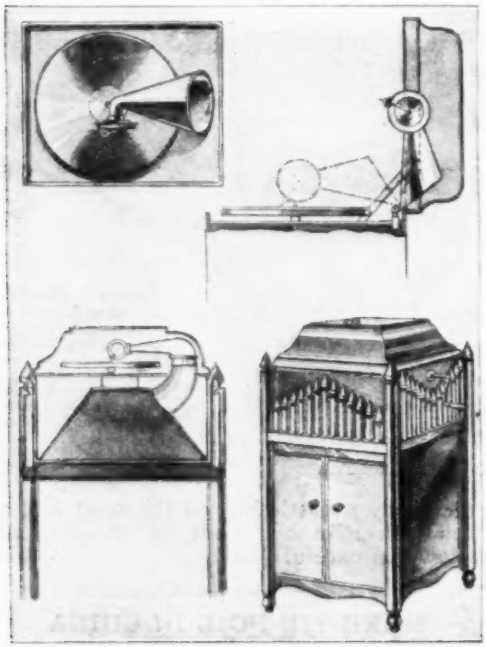
This Elaborately Embroidered Strip of Linen was Made in Two Years' Spare Time by a Nimble-Fingered Mechanic. He Worked 574 Skeins of Silk Thread into the Various Designs

MAKE TIN FOIL IN CHINA BY PRIMITIVE METHODS

In China the natives still make their tin foil by the most primitive methods. Pieces averaging 1¼ by 2 in., cut from thin castings of tin, are piled on granite, 210 deep; the reason for the particular number is not apparent to the occidental eye. This pile is hammered down, and another placed on top of it, and so on until the stack is 3,360 sheets deep and about 12 by 24 in., padded with leather at the bottom and waste foil at the top. Heating the aggregation at intervals prevents sticking. The sheets are finally cut in three pieces and beaten to about 13 by 18 in. The Swatow district uses some 700 tons of tin a year for this purpose, each 100 lb. producing 60 to 70 lb. of foil, or a total annual output approximating 450 tons.

INVENTORS PATENT TWO UNUSUAL PHONOGRAPHS

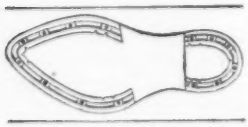
In the ordinary talking machine the sound waves travel from the reproducer, through the movable arm, to an amplifying horn in the body of the machine. In an odd design of recent patent, however, the movable arm is enlarged, and itself becomes the horn. In another, equally curious, the sound waves are led from the amplifying chamber in the cabinet through miniature organ pipes ranged around the sides. It is not known what merits are claimed for these machines by their inventors.



The Upper Phonograph Combines Movable Arm and Amplifying Horn. In the Lower Arrangement the Sound Waves Pass through Miniature Organ Pipes

STRIPS APPLIED TO SOLES PREVENT WEAR ON SHOES

To save wear on shoes, a New Zealand inventor provides an attachable wearing strip, applied like a border around the sole or heel. It may be bent to fit any shape of shoe. A longitudinal channel down its center holds sliding washers, and screws through these fasten the strip.



STEAM BATH MAKES IRON PROOF AGAINST RUST

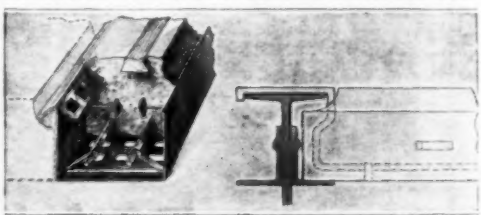
By subjecting iron at red heat to the action of superheated steam, a European scientist is said to obtain a product that is not attacked by rust and corrosion, and is therefore particularly desirable for bridgework and other exposed construction. The protective value of this oxidized coating depends both on the temperature of the steam and on the length of the treatment. Thus, exposed for five hours at 260° centigrade, the coating is said to withstand the action of emery paper for a considerable time; while a rise in temperature to 650° centigrade and an increase in time of treatment of six or seven hours, yields a coating that will withstand the action of a file.

VETERAN CAVALRYMAN RIDES DESPITE LOSS OF LEGS

Strollers in the Bois de Boulogne, just outside of the old "enceinte" of Paris, France, were recently surprised to see a legless horseman cantering along the bridle path, accompanied by a mounted attendant. The rider sat upon a sidesaddle, to which he was secured by a strap around his waist. Friends who recognized him as an old cavalryman were quick to applaud his pluck in overcoming his handicap.

REINFORCED-CONCRETE UNITS FOR BUILDING FLOORS

For the convenient and rapid laving of concrete floors, and other structural surfaces, an eastern architect has devised a system of reinforced-concrete units, which may be cast anywhere and used when needed. Each unit is full span length, the ratio of length, width, and depth being approximately 16, 2, and 1. Bottom, sides, and ends of each unit are inclosed in a sheet-metal trough, with a perforated bot-



Left View Indicates How Concrete Unit is Cast in Metal Trough with Interlocking Flanges. A Wood Strip for Nailing is Seen Molded in the Unit. Use of Reinforcing Member as a Hanger is Seen at Right

tom to expose a concrete furring surface, and shaped edges to interlock with the filling and with adjacent units. End extensions of the reinforcing bars support the units in the structure.

NATION'S SUPPORT PROMISED FOR EMPLOYMENT PROGRAM

As a result of a searching investigation made by the director of the Council of National Defense, it has been revealed that every city and state in the union is willing, and in most cases prepared, to aid the council's Emergency Committee on Employment. Not a single state, county, or community wishes to shirk this important phase of peace-time reconstruction. With these encouraging assurances behind him, the director is delegating 35 army officers to various parts of the country where they will make every effort to coördinate all this enthusiasm in a definite program that will abolish unemployment.

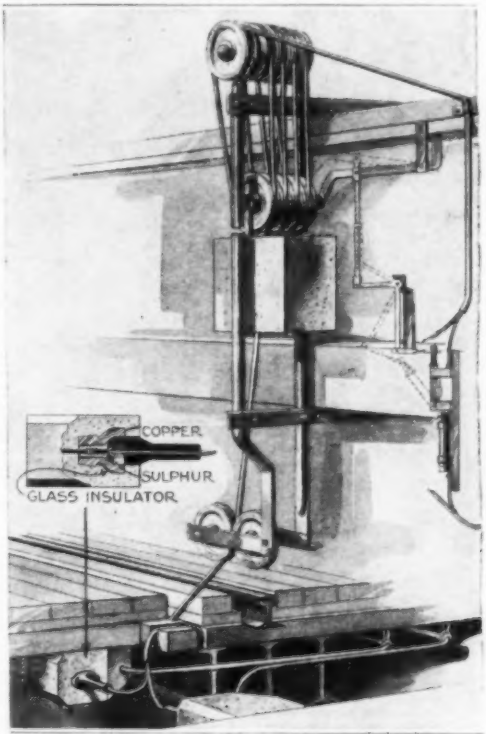
DRAWBRIDGE SUFFERS IN COLLISION

Two powerful tugs recently attempted to guide a newly launched vessel through the open draw of a heavy railroad bridge at Aberdeen, Wash. The tide caught the vessel, however, ramming it into an adjacent stationary girder which it forced five feet out of line. The ship was practically undamaged, but rail traffic over the bridge was made impossible for six weeks, necessitating a detour over another line. Another result of the mishap is a suit for $21,000 damages, filed against the local shipyard by the Director-General of Railroads.

A Vessel Struck and Bent This Heavy Girder Instead of Passing through the Draw

AMERICAN ABILITY IN FRANCE SOLVES DOCK-CRANE PUZZLE

When the only available materials must be picked out of a junk pile, making electrical connections for a traveling crane

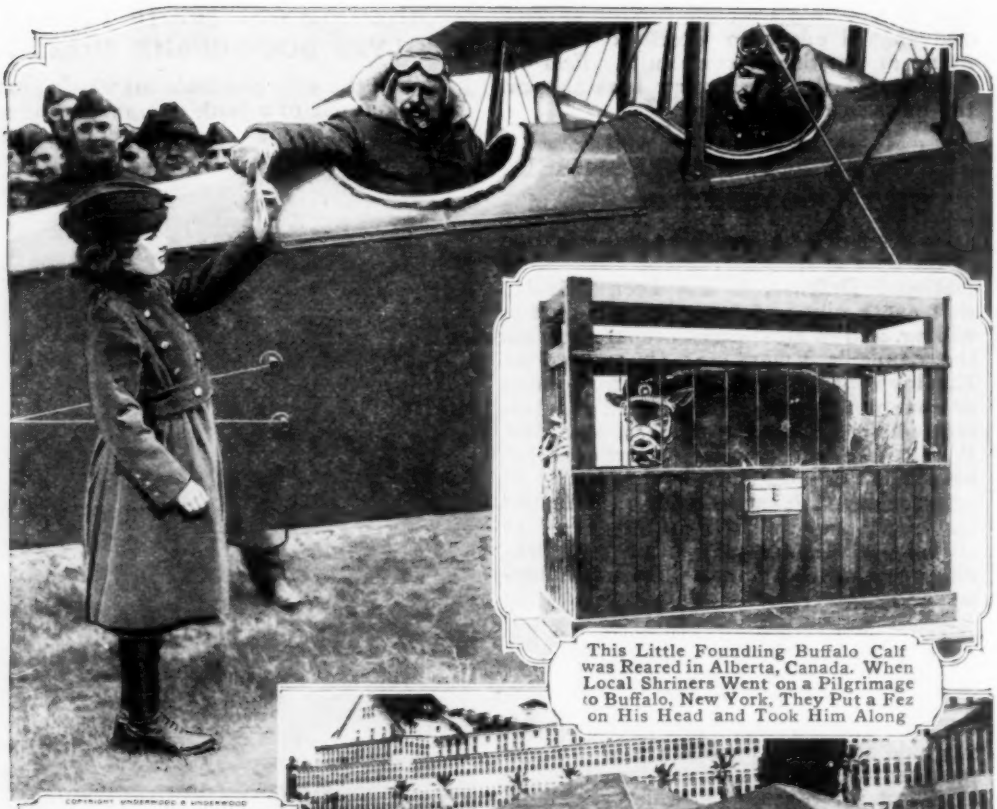


Flexible Electric-Cable Connection to a Traveling Crane, Made Out of "Junk": Sectioned Insert Shows How Concrete, Glass, Sulphur, and Copper Made an Efficient Junction Box with a "Fool-Proof" Plug

using 550 volts from a 12,000-ampere cable is quite a large order. That is what American mechanics did on American docks in France. The feed cable was run over sheaves made of concrete, reinforced with ½-in. mesh wire, bushed with pipe, and running on roller bearings fashioned from wire nails. At the end of travel, a counterweight on the cable tripped an iron lever and opened the switch. For each junction box a topless glass insulator was buried in concrete, its copper sleeve fastened with cast sulphur. The wood-handled plugs were so shaped that the copper blade could enter the box only in the right position, preventing arcking. Sheave supports were made of iron pipe.

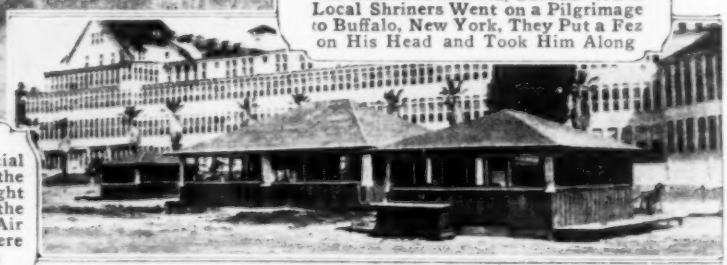
¶Army airmen and airplanes are prohibited by a recent ruling from further participation in exhibitions for purses or individual prizes.

BOYS AND GIRLS NEVER HAD WIDER INTERESTS



The Girl is Handing Official Letters to Her Father on the Occasion of the First Flight Made by an Airplane of the New York Police Reserve Air Service. The Letters were Carried to Philadelphia

This Little Foundling Buffalo Calf was Reared in Alberta, Canada. When Local Shriners Went on a Pilgrimage to Buffalo, New York, They Put a Fez on His Head and Took Him Along



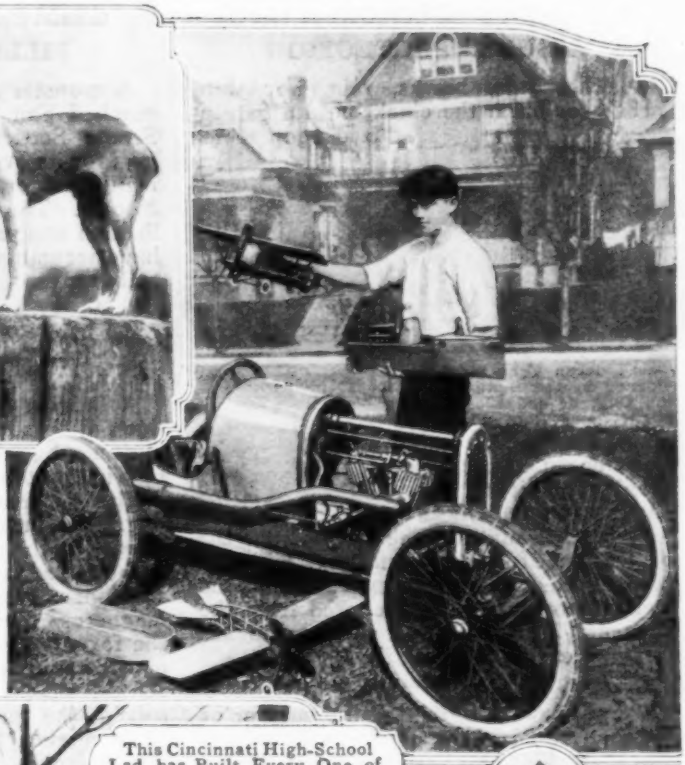
These Schoolhouses on the Sunny California Beach Shelter 50 Pupils, Who Find Study Difficult at Times, as the Pacific Ocean is Less than 20 Yards Away

Posters Like This Teach the Little Folks in Belgium That the Shells and Fuses They Find along the Roadsides and Half Buried in the Fields Make Dangerous Playthings

Each of These Smiling Fathers Carried on His Back the Finest Boy or Girl in the World during a Specialty Race Held at a Municipal Picnic in City Park, Cincinnati. The Judges Couldn't Decide Who Became More Excited, Fathers or Children

THAN IN THE PRESENT COLORFUL, CHANGING TIMES

Old "Vic" Turns Up a Disdainful Nose at German Sausage. "Vic" Campaigned with the 332nd Infantry in France, Journeyed Back with Them on the Transport, and is Now Trying to Get His Discharge from the Army at a Demobilization Center



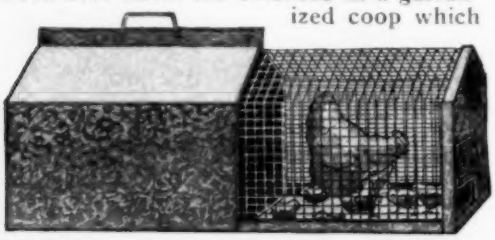
This Cincinnati High-School Lad has Built Every One of These Machines Himself—Submarine Chasers, Airplanes, and Racing Car. The Automobile is Said to Travel 70 Miles an Hour although the Wheelbase Measures Only Six Feet and the Motor Has Only Two Cylinders

The First Trees to be Dedicated to the Memory of the Late Theodore Roosevelt were Recently Planted in a New York Park by Boys and Girls Interested in the Planting and Preservation of the City's Trees. These Living, Useful Memorials Are Certainly What the Colonel would have Desired

This Tombstone Marks the Grave of a Loyal and Earnest Boy Scout. When He was Drowned, While Swimming Not Long Ago, His Parents Decided to Bury Him in His Scout Uniform, and to Place above His Head This Enlarged Cast of the Medal He Wore So Proudly

TELESCOPING CHICKEN COOP ASSURES PROTECTION

Neither rats, hawks, rain, nor snow need ever harm the chickens in a galvanized coop which



This Chicken Coop may be Opened to the Sunlight in the Daytime and Closed at Night against Rain and Snow

is made in two telescoping sections. In the daytime the chicks may safely range on the lawn under the protection of the wire netting, while at night, by telescoping the two sections, the owner knows they are sheltered from the elements. A removable bottom makes cleaning easy.

¶ It has come to light that the curator of the Louvre Museum carried a $2,000,000 jewel in his vest pocket from Paris, France, to safety at Bordeaux, when the Germans first menaced the French capital.

GREAT RUBBER SHIPMENT FILLS ENTIRE TRAIN

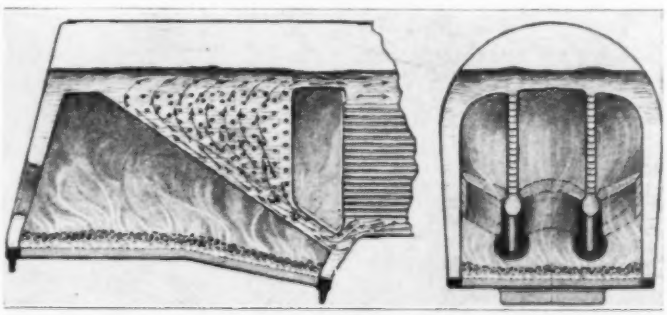
A monster shipment of rubber recently reached San Francisco from Singapore, Straits Settlements. Loaded on freight cars for its overland journey to an eastern manufacturer, it filled a special train of 26 cars. The shipment weighed 2,240,000 lb., and was part of the great supplies that have accumulated because of the war-time embargo on importations.

MAKING AUTOS INOPERATIVE IF SEIZED BY ENEMY

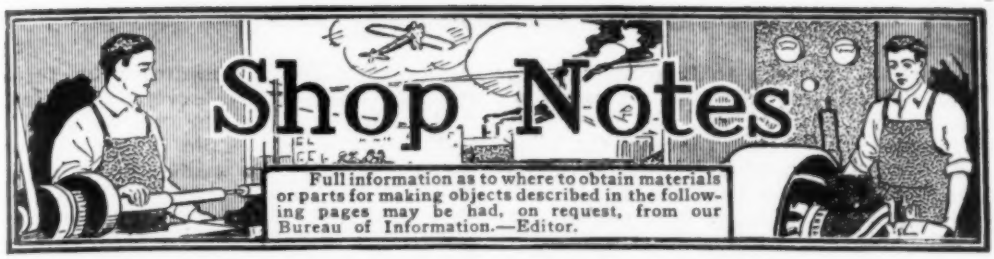
A Belgian mechanical engineer was requested by some of his clients to devise a method whereby their automobiles might be made inoperative, in case of seizure by the enemy, without harming the machines. When the magnetos were of the form having permanent magnets arranged in pairs, he solved the problem by reversing one magnet of each pair. The magneto, thus neutralized, produced no spark, and yet was readily restored to its former usefulness.

IMPROVE LOCOMOTIVE FIRE BOX AND SAVE COAL AND WATER

By saving 30.3 per cent in coal and 11.1 per cent in water, a locomotive on a western railroad has just demonstrated that a simple change in the fire box is productive of remarkable results. In non-technical terms, the improvement consists of two hollow partitions, shaped like flattened triangular funnels, which divide the fire box lengthwise. The lower "spout" end joins the throat of the boiler, while the broad upper end is connected to the crown sheet at the top of the fire box. The oblique front and vertical rear edges are closed, allowing the hot gases to circulate around the funnels, or siphons, which are 4 in. thick. This additional circulation of boiler water resulted, by the test, in a 27.92-per-cent increase of boiler efficiency. For economy in manufacture and marketing, each siphon is formed from a single sheet of steel, bent and welded, the elongated throat of which may be cut to fit any locomotive fire box.



Siphons in a Locomotive Fire Box: Left View Is a Longitudinal Section, and Right View a Vertical Section through the Funnel-Shaped Water Walls, Circulation of Water through Which Increased the Boiler Efficiency Greatly. The Black Dots Are Braces across the Tube


Shop Notes
Full information as to where to obtain materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

How to Keep Chair Rungs from Pulling Out

By S. B. ROYAL

IN a large manufacturing plant where many chairs and stools are used, it was found that, among the chairs which were put out of service due to breakage, by far the greater number had suffered from the rungs becoming loose and pulling out of the leg. It is probably true of most chairs that the weakest point is this fastening of the rung in the leg. The plant referred to finally adopted, for all repairs of this kind, a method consisting of springing a steel ring into place in such a way that the rung is permanently held into the leg. The method is shown in Fig. 1, the final position of the rung being seen at the right. It is practically impossible to pull the rung out when it has been correctly fastened in this way; and it is found that chairs thus repaired stay in service until breakage occurs in some other part.

The ring is formed to a diameter, measured on its center line, exactly equal to that of the chair rung. At a suitable distance from the end of the rung a groove is turned in the lathe, of a width equal to the diameter of the wire used in the ring, and of a depth also equal to this same diameter. Inside the rung hole in the chair leg is cut a groove of the same width, but of a depth equal to half the diameter of the ring wire. The ring is sprung into the groove on the rung, which is then forced into its hole. The ring, upon reaching the groove in the hole, springs outward to fit it, and the fastening is complete. It is apparent that a gap must be left in the ring sufficient to permit springing it into the groove on the rung.

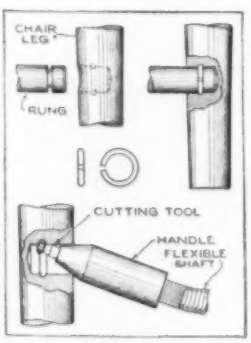


Fig. 1

The making of the metal ring and the rung groove is work which any mechanic can do with common tools, but the making of the internal groove in the chair leg is a job that will require some sort of special tool. In the factory mentioned, a tool was used which was mounted on a flexible shaft, as shown below in Fig. 1. The cutting tool proper is screwed into the head of the flexible shaft. Mounted on the flexible shaft is the handle, with a conical end of suitable proportions. This tool fits into the hole in the chair leg, as indicated, and it is the work of but few seconds to rotate the handle once around the hole, and thus cut the groove.

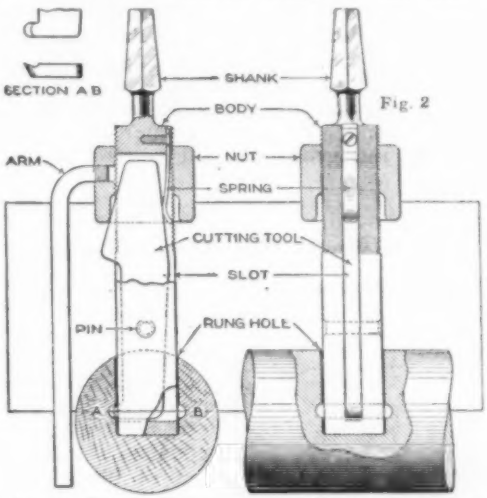


Fig. 2

As the Tool is Revolved by the Brace, Its Body Remains Stationary, but the Cutting Edge is Fed into the Groove

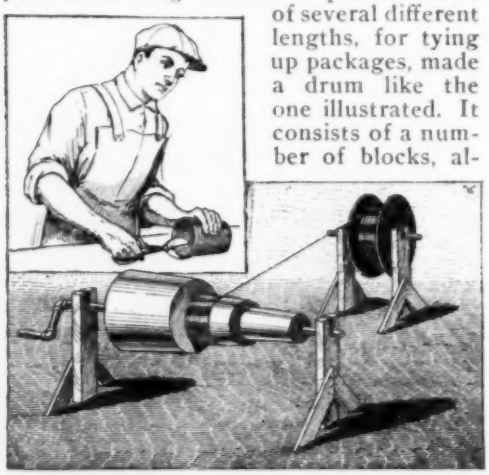
For the repair man who has no power-operated flexible shaft, an excellent tool, which can be used in an ordinary bit brace, is shown in Fig. 2. The body of the tool is made from a piece of soft, round steel of the same size as the chair rungs to be fastened, or slightly smaller. On one end of this bar, a shank is formed to fit the brace. Almost the entire remaining portion of the bar is cut through,

forming a long slot to take the cutting tool. This is fastened with a single pin, on which it turns freely. Its lower end is formed to cut the groove in the rung hole, as it is forced into the wood of the chair leg by the nut at the upper end. This nut turns on a left-hand thread, cut on the body of the tool. It has a rounded inner surface at its lower end, which comes in contact with the taper side of the cutting tool.

In operation, the shank is turned to the right like an ordinary bit, and the nut is kept from turning by an arm which bears against the chair leg. As the cutting tool is revolved on the pin by the pressure of the nut, the cutting edge at its lower end is fed into the wood, cutting a clean groove. This edge should be of a proper shape for cutting wood, like the detail in the upper left-hand corner of Fig. 2. When the groove is cut to the proper depth, the tool is withdrawn by turning the brace in the reverse direction, and pulling out from the chair leg. It is well, in practice, to note the number of turns necessary to give the brace in order to cut a groove of the proper depth, and then to use this number of turns for each groove. No great harm is done by cutting the groove too deep, if the ring is formed of the proper size, as the rung cannot pull out even if the ring falls out of center. If the tool is made so as to give sufficient motion to the cutting edge, the groove in the chair leg can be given the extra depth, and the one in the rung will then be only half as deep as the diameter of the ring stock. There is but slight advantage in this method, since the cutting of a deeper groove in the rung weakens it but very little, and, in practice, it is found that chairs repaired in the way described, give no further trouble from this cause.

Drum for Cutting Wire to Length

A concern which used, in its shipping department, a large number of pieces of wire of several different lengths, for tying up packages, made a drum like the one illustrated. It consists of a number of blocks, almost cylindrical, but having a very slight taper, mounted on a piece of iron pipe and soldered to it. The average circumference of each block is just the length that the pieces of wrapping wire are to be. After a sufficient quantity of wire is wound around the drums, the slight taper permits the coil of wire to be readily slipped off. It is then cut through with a pair of shears, converting each turn of wire into a piece of the proper length.—F. W. Smith, Trenton, Tenn.



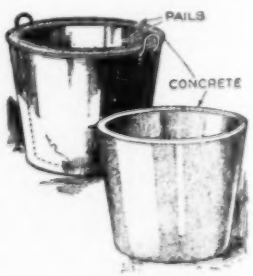
A Simple Device, Made of Pipe and Wooden Blocks, Produces Pieces of Wire of Nearly Uniform Length

Improvised Wire Drawer Handles

To make a handle for a small drawer in a desk or kitchen cabinet, bend a piece of stiff wire until it forms three sides of a rectangle, one of the longer sides being missing. Then turn each of the short sides outward about ⅜ in. from the end, to make hooks with which the handle can be fastened to the drawer by staples. The latter should be so spaced that there is very little end play, and if the staples are hammered deep into the wood there is no danger of the handle working loose.—Abel Green, New York, N. Y.

Concrete Flowerpots

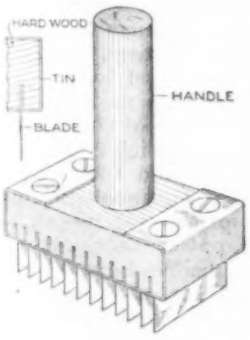
Two pails can be combined to make a form for molding concrete flowerpots. The only necessary condition is that, when one pail is placed within the other so that their vertical center lines coincide, there will be an interval of not less than 1 in. between them, no matter at what point the distance is measured. If it is larger, the pot will, of course, be rather thick at the walls or bottom. Mix a shovelful of cement with twice that quantity of finely sifted coal ashes, and add enough water



to make a loose paste. Put it into the larger pail with the smaller pail above it, keeping the latter one inch above the bottom of the larger pail by hanging it from a horizontal stick supported by two uprights. Before the mixture is dry give the inner pail half a turn so as to keep it from sticking to the cement, and when the material has set, take the pail out and let the concrete harden thoroughly. Then take out the pot and drill a hole in the bottom for drainage.—C. A. Black, Jr., Hightstown, N. J.

Chopper Made with Razor Blades

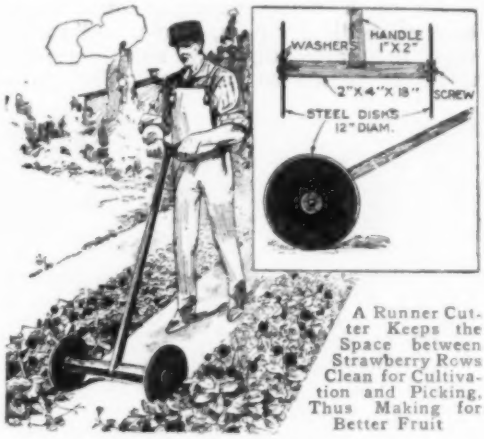
A number of old safety-razor blades may be put to use by being built into a chopper to be used with celery, nuts, or other salad materials. A block of good hard wood, about ½ in. wider than the length of the blade, should have several slots sawed in it, as shown, just wide enough to take the backs of the razor blades. A piece of tin, or other thin sheet metal, is fastened over the block, having slots cut in it which are just wide enough to take the blades, but not the backs. These slots should also be just long enough to take the blades, so that a strip of the solid tin remains at the sides of the chopper. The slots in the tin may be cut with a cold chisel. The tin should be drawn over the block quite tightly and fastened with screws. On account of the probable stretching of the tin, if the cold chisel is used for this purpose, it will be found advisable to complete the slotting in the tin before starting to saw the slots in the wooden block.



Runner Cutter Keeps Strawberry Bed Clean

Strawberry runners grow into the space between rows, take root, and fill the space with new growth. This not only hinders cultivation, but it makes picking the ripe berries difficult, by leaving practically no room to work in.

The runner cutter shown in the sketch is pushed along the space between rows, cutting all runners that extend, and thus keeping the space clear. The cutters are disks of heavy-gauge sheet steel with edges filed sharp. These are fastened to the ends of the axle with heavy lag screws, or large spikes. Washers should be placed on each side of the disks so they can turn easily. The handle may be made from a broomstick, or a piece of hickory, 4 ft. long. It takes only a few minutes every other week to run between the rows with the cutter. It is not necessary to remove the dead runners.—J. Horace Van Nice, Chicago, Ill.



A Runner Cutter Keeps the Space between Strawberry Rows Clean for Cultivation and Picking, Thus Making for Better Fruit

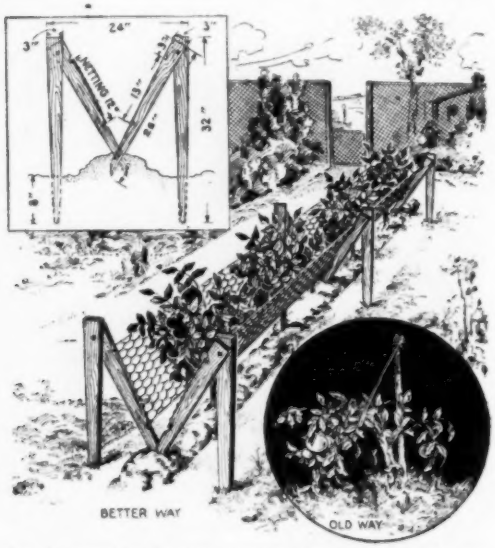
An Overhead Coat Hanger

By hanging garments overhead valuable space is saved in a western factory. The crosspiece is shaped like an ordinary coat hanger, and the handle is about 5 ft. long. Horizontal rods or piping support many rows of these articles, and when garments are damp they are quickly dried in the warm air at the top of the cloakroom.

Clothes are Hung near the Ceiling, by Long-Handled Hangers, to Make Extra Space in a Coat Room

An Adjustable Garden Trellis

Although many gardeners use some sort of trellis for peas, beans, and tomatoes, they are not, as a rule, carefully made, or permanent fixtures. They may



An Adjustable Garden Trellis Makes It Possible to Cultivate Longer, and Gives Better Light and Air to the Crop

even hinder the process of cultivation, and generally become useless before the harvest season is ended.

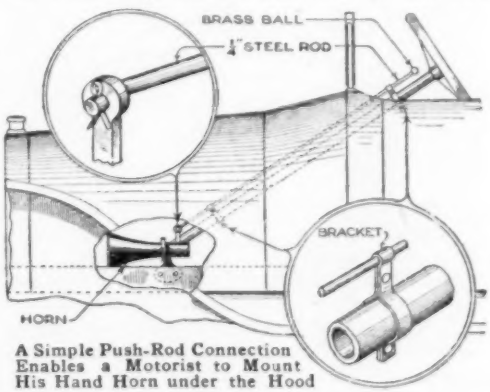
The drawing shows a simple trellis, designed to avoid most of these faults. It consists of several adjustable supports, and two lengths of wire poultry netting. The supports can be folded, and the wire can be rolled so that it is possible to put up or take down the trellis very quickly, and but little space is required for its storage. In spite of this feature, the trellis is sturdy, holds the foliage off the ground, makes it possible to cultivate the plants easily, and at the same time gives free access to the air and light, which is essential if the best results are to be obtained. This is especially true of tomatoes, which ripen more quickly, and form more perfectly, if they have plenty of air and light, and are not rotted by being hidden under a mass of wet foliage. Since the trellis holds the vines out of the dirt, the crop is not spattered with dirty water, and is therefore kept cleaner.

Each support of the trellis is made of four pieces of 1-in. lumber. Large cotter pins are used for pivots at the three points. Notches are cut in the inner edges of the V-pieces, to hold the poultry netting. To set up the trellis, push in the stakes, spacing the supports from 3 to 4 ft. apart in the row, depending on the crop. Stretch lengths of 2-in. mesh poultry netting, 12 in. wide, along each side, fastening it by catching its edges in the notches of the V-pieces. For ease in handling, no strips of netting over 25 ft. long should be used.

If there is a tendency for the trellis to sag later in the season, due to the weight of the crop, sticks may be placed horizontally to hold the supports apart, and kept from falling by wire hooks and screw eyes.—Geo. Motzer, Ionia, Mich.

Automobile Hand Horn Mounted under Hood

A hand-operated automobile horn has the merit of reliability. The simplicity of its construction reduces to a minimum the chance of its getting out of order, whereas the operation of an electric horn is complicated by the presence of other than purely mechanical factors. But as an electric horn is controlled by a wire and push button, it can be mounted in any position relative to that of the operator, whereas a hand horn, which is worked by moving a lever back and forth, cannot be mounted at a distance without some additional equipment for transmitting the mechanical power necessary to operate it. Since a visible horn is apt to mar a car's appearance, the owner of a machine mounted his hand horn beneath the hood on one of the frame members, and connected the lever to a ¼-in. steel rod, which he attached to the steering column by two brackets made of 1-in. strip steel. The top of the rod



A Simple Push-Rod Connection Enables a Motorist to Mount His Hand Horn under the Hood

was threaded so that a 1¼-in. brass ball could be screwed on to it for a handle, and the lower end was bent at a right

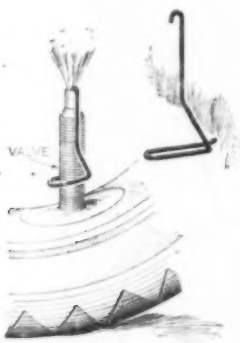
angle and passed through a hole drilled in the horn lever, where it was secured with a cotter pin.—G. A. Luers, Washington, D. C.

Enlarging Holes with a Punch Using Original Centers

In steel-plate work, it occasionally happens that holes are accidentally punched too small. The laborious process of reaming can be avoided by punching the holes again, but it is necessary to use caution in preventing the new holes from being punched off center. The old punchings, if not lost, can be replaced in the holes, and the original centers used in locating the new ones.

Wire Holds Tire Valve Open

It usually takes some time to let the air out of an inflated tire. The wire tool shown in the sketch holds the tire valve open, allowing the air to escape, and the motorist's hands are free to do other work while waiting for the air to be exhausted. The tool is simply a short piece of stiff wire with a hook on one end to hold the valve open, and a loop on the other end which catches on the threads of the valve stem.—F. E. Schmidt, Ocean Springs, Miss.

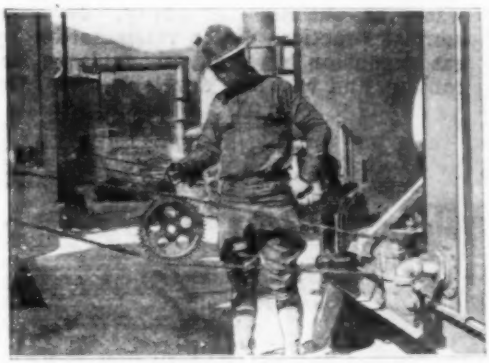


Removing Paint from Clothes

Treating a paint stain with a solvent does not necessarily remove it. Unless some method is used of taking it entirely away from the stained surface after dissolving, it merely spreads over a larger area. To remove paint from cloth, lay a pad of blotting paper on the side of the material on which the paint fell, and rub the other side gently with a soft piece of flannel dipped in chloroform or benzol, both of which are paint solvents. As the paint dissolves it naturally passes into the most aborbent material in contact with it—which is the blotting paper—not into the adjacent cloth. Deep stains can be completely removed by this method.

Idle Sprocket Keeps Drive Chain from Flapping

Where long drive chains must be used to transmit power, idle gears like the one

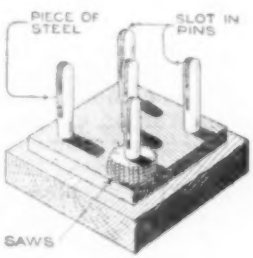


The Idle Gear Rolls Peacefully between the Sides of the Chain, but It Keeps the Chain from Flapping

shown in the accompanying photograph are useful in preventing undue flapping, and the consequent tendency of the chain to ride up on the sprockets and run off. With such a gear, chain adjustments to compensate for wear are reduced to a minimum. On very long chains, several idle gears might be used without undue sacrifice of power.—John E. Hogg, Alhambra, Calif.

Rack for Small Circular Saws

A tool-crib man, whose duty it was to take care of a large number of small circular saws, giving them out to the machinists as required, found that a rack like the one illustrated saved a great deal of his time. The rack consists of several pieces of drill rod, slightly smaller than the center hole of the saws, mounted in a wooden block, with slots sawed down their centers. Small pieces of steel separate the two prongs of each rod very slightly, so that the saws will not drop off if the rack is knocked over. They can be pulled off with the fingers by exerting a little force which springs the prongs in slightly. The ends of the prongs must be well rounded off, so that the saws can be quickly replaced.—Peter Dyer, Jr., Fall River, Mass.



An Automatic Refrigerating Machine for the Home

By KENNETH M. COGGESHALL

HOME refrigeration, so necessary for keeping foods in hot weather, has, until recent years, been entirely dependent on ice, which was often frozen from water of questionable purity. In commercial practice, direct refrigeration by gas expansion has gradually replaced ice-cooling, and with the development of the

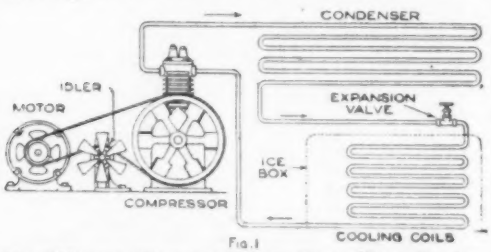


Fig. 1

The Different Elements Which Go to Make Up the Refrigerating System are Shown in Outline in the Diagram, without Any Attempt at Accurate Representation

modern machinery for the purpose, it is entirely within the ability of the home mechanic to assemble and install a cooling system, which will operate with very little attention. For this type of outfit electricity for power is essential.

The principle on which expansion-refrigerating systems work is that when a gas under pressure is allowed to expand, owing to the pressure on it being reduced, it absorbs heat from the surrounding substance, or, in other words, "radiates cold." When the gas is first placed under pressure, it becomes hot, and it is first necessary to let this heat radiate off, in order that the gas when expanded will do efficient cooling. A simple diagram of the apparatus necessary for these operations is shown in Fig. 1.

Gases which have been used for expansion-cooling systems include ammonia, carbon dioxide, sulphur dioxide, and others. In commercial machines ammonia is the favorite. Carbon dioxide, if used at a very high pressure, is also an efficient medium. As high pressure is out of the question in a homemade apparatus, and as ammonia must not be brought into contact with brass and copper, the medium which is here recommended for use is sulphur dioxide. This gas can be purchased in small cylinders, and besides acting as heat absorber, it lubricates the compressor to such an extent that internal oiling is unnecessary.

Motor and Compressor

The electric motor should be of ¼ hp., 1,750 to 1,800 r.p.m., equipped with a flat or crown-face pulley, 3 in. in diameter by 1¾-in. face. As noise is an important factor, as quiet-running a motor as possible should be procured.

Great care must be exercised in the selection of the compressor, which should be of the air-cooled type. The cylinder bore should approximate 1⅝ in., although any size up to 2 in. is permissible. The stroke should not be over 2½ in., and 2 in. will be sufficient. The compressor should operate at best efficiency between 500 and 700 r.p.m.; thus the pulley, or flywheel if it serves as a pulley, should have a diameter of 9 or 10 in., to allow the proper speed reduction between the motor and compressor. Many air compressors are equipped with a safety valve, or "unloader," which automatically relieves the back pressure against the piston when the former reaches any predetermined limit. With a motor of only ¼ hp., there is little possibility of the gas pressure reaching the danger point. The valve should, therefore, be disconnected, to prevent the gas from escaping.

Since the driving motor must be located quite near the compressor, efficient power transmission requires that the belt be provided with an idler, or tightener. This device should be furnished by the compressor manufacturer. If possible,

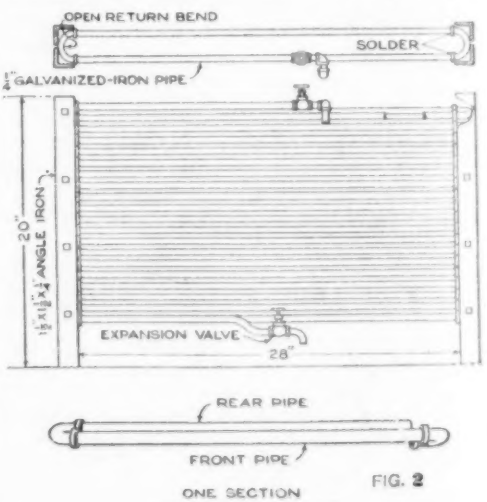


FIG. 2

The Condenser, Made of Iron Pipe, Is the Means by Which the Heat is Finally Radiated Off into the Atmosphere

six 5-in. fan blades should be secured to the pulley in such a manner that, as the moving belt turns it, a small volume of air will be kept in circulation past the condenser coils.

Condenser

To remove the heat produced in the gas by compressing it, it is held for a time in coils of pipe outside the refrigerator. A general view of this condenser is shown in Fig. 3, while the details are seen in Fig. 2. Forty lengths of pipe, threaded at each end, are required for the condenser, as drawn. Galvanized-iron "open return bends" are used to form a spiral of pipes, 20 sections high. Each section is made as detailed, and they are joined as indicated in Fig. 2. As each section is added, the joints are heated with a blowtorch, a touch of acid is added, and solder is sweated around the edges to fill every possible avenue of escape for the gas. All joints must later be tested under pressure. The condenser-pipe spirals are supported as indicated in Fig. 2. The open pipe in the top section should be shorter than the others; a ¼-in. valve should be screwed on and the joint soldered. This valve is connected to the compressor during final assembly.

The expansion valve, seen in Figs. 1, 2, and 3, is a very important part of the system. After the hot gas has been cooled and liquefied in the condenser, the fluid is allowed to pass through this valve in a small stream which rapidly expands to a gas. Either a globe or gate-type valve may be used, but it must be a good one; it must be located as near as possible to the actual cooling coils, since the refrigerating effect begins immediately on the low-pressure side of this valve.

Cooling Coils

The cooling, or expansion, coils, seen in Fig. 3, are rather more difficult to construct. Rather than make these of galvanized-iron pipe it is better to get annealed copper or brass tubing of ¼-in. iron-pipe size in long lengths. There will then be few places where two tubes must be connected, and compression couplings may be employed here to advantage. The form of these coils shown is intended for a refrigerator having an ice compartment, about 11 by 14 in., and 12 in. deep. Eight sections of tubing, such as detailed, will be required. Besides these a rest is formed from the tubing below the coils, on which a shallow pan of water may be placed when ice is required. The outlet of the cooling coils passes up through the top of the refrigerator, and is connected to the intake of the compressor. The entire set of coils is supported by two narrow brass strips, which pass around the coils and fasten to the top of the ice compartment.

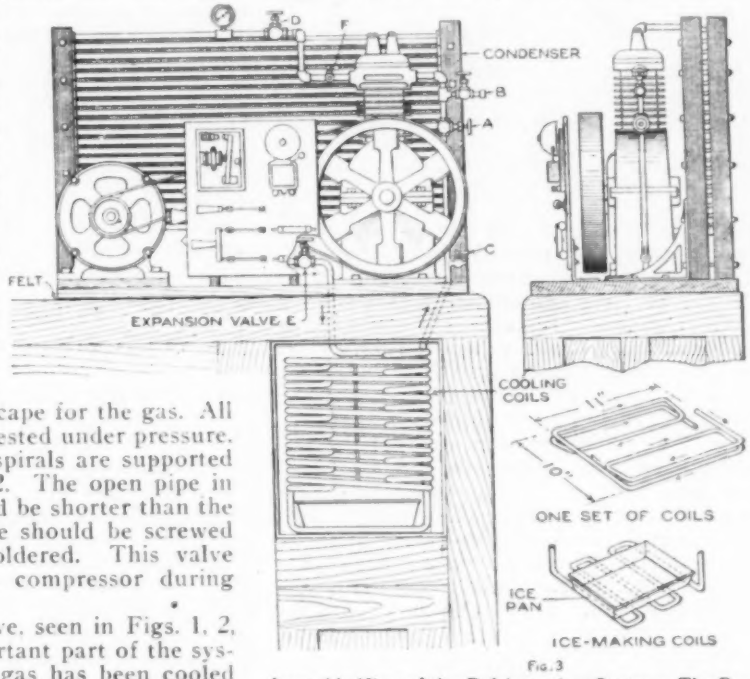


Fig. 3

Assembly View of the Refrigerating System: The Position of the Various Valves and Air Cocks is Shown, as Well as the Construction of the Cooling Coils

Thermostatic Control

It would not be efficient or economical to keep the compressor in operation all the time. Foods are best preserved when the temperature is cool and constant—it should be kept preferably between 45 and 50° F. in the food compartment, and should not rise above this, nor should it fall to the freezing point. With the aid of a few simple electrical devices, the temperature may be maintained practically constant at all times. The diagram of the entire electrical circuit is shown in Fig. 4. A thermostat, placed near the cooling coil, can be so adjusted that when the temperature rises to a predetermined point, an electric circuit is established through a relay, which in turn operates to connect the driving motor with the outside current supply. After the refrigerating machine has operated for a suffi-

cient time to allow the temperature to drop to the desired point, the thermostat breaks the relay circuit and the motor stops. As a precaution, however, against some part of the relay system failing to

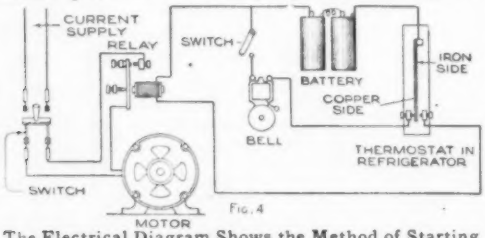


Fig. 4

The Electrical Diagram Shows the Method of Starting and Stopping the Motor by the Action of the Thermostat

function, thus allowing the apparatus to reduce the temperature in the refrigerator to a point where the food is in danger of freezing, provision is made so that in such an instance the thermostat will cause an alarm gong to ring.

The ordinary thermostat is founded on the principle that different metals have different rates of expansion with temperature. If, for instance, a strip of copper and one of iron are soldered together, and one end held rigid, the other end will bend toward the copper side when cooled, but toward the iron side when heated. Thermostats for this purpose can be purchased, or can be made from materials easily obtained. Fig. 5 shows a thermostat so constructed. The principal parts are detailed at the right, and the manner in which they are put together is shown at the left. The contact points on the strips may be made by setting through each a copper rivet, or bits of special alloy wire made for contact points can be soldered on. Similar points may be soldered on the ends of the contact screws, but this is not necessary, as the circuit breaks so seldom. Some kind of protecting cover should be made from sheet metal to fit over the thermostat, and should have holes punched in it to allow circulation of air. It is handy to fasten a thermometer on the cover to serve as a guide while making adjustments.

Relay Switch

While the current required to drive the motor is small, on account of high voltage, it is not advisable to use the light contact points on the thermostat to make and break the main circuit. A relay switch thus becomes necessary. One which is suitable for this use can readily be purchased, or can be made as shown in detail in Fig. 6. The electromagnet can be taken from a large electric bell, or telephone instrument. It should have quite a strong pull in order to insure good operation. The electromagnet must be held very firmly, and may be set into the slate panel slightly, if it is a very heavy one. Connections are made as shown in Fig. 4. The wires leading to the electromagnet are not shown in Fig. 6; the wires from the main circuit should be connected to the two binding posts shown. One of these binding posts is connected to the relay arm by a piece of flexible stranded wire, or "pigtail," which should be soldered to both the binding post and the relay arm. Considerable movement must be allowed on both the stop screw and the tension screw. The two carbon contacts, which are cut from old arc-light carbons, should be held tightly together whenever current is flowing through the electromagnet. To insure this, the carbons must be so adjusted that there is considerable space between the electromagnet core and armature, when the carbons are in contact. The tension screw may be merely a machine screw threaded into a small brass block. One end of the spring is soldered to the screw so that, as the screw

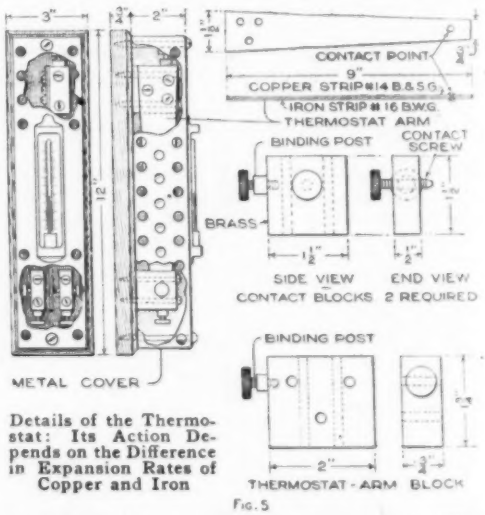


Fig. 5

Details of the Thermostat: Its Action Depends on the Difference in Expansion Rates of Copper and Iron

is turned, the tension is increased. The other end of the spring may be soldered to the relay arm, or held by a small cotter pin.

Final Assembly

On the electric control panel board, which may be of slate or wood, assemble the relay, the battery switch, the supply-circuit switch, the necessary fuses, and a good, loud electric bell, to serve as an alarm.

The baseboard for the complete refrigerating machine, 2 by 18 by 31 in., will, of course, be built up of a number of smaller boards glued and screwed together. Several layers of felt should be placed between the board and refrigerator, to deaden the noise and vibration. At the back of the board, as shown in Fig. 3, is assembled the condenser; it is held in an upright position through the aid of iron brackets fastened between the angle irons and the baseboard. In front of these coils, from left to right, are placed the motor, the fan and idler, and the compressor. The three are belted together. The cooling coils are suspended in the ice compartment, the inlet pipe at the top being connected to the upper valve, while the outlet at the bottom is connected to the intake side of the compressor. In this latter pipe line, however, is a valve A. Above A is a tee connection to another valve, B. This valve will remain tightly closed after the system has been charged with gas. Below B is a small air cock, C, whose use will be described later.

The exhaust side of the compressor is connected, by ¼-in. pipe, to a valve, D, which is similar to A. Both these valves will remain wide open and will require no adjustment after the system is charged. In making these several connections, a number of couplings, reducers, tees, and unions are required. If desired, a pressure gauge, registering from 0 to 100 lb., may be put in the condenser circuit. The switch panel is situated conveniently near the front and center of the board. The thermostat is placed in the food compartment, and all electrical connections are made according to Fig. 4. It is best to use rubber-covered wire for the electrical circuits.

Operation

The machine is now ready for test. Open all valves; if all bearings have been properly oiled, start the motor, and notice whether the apparatus runs smoothly. With B still open, close C and A. Air will be drawn in through B, and the entire system will soon be under pressure. As the pressure increases, watch the joints for leaks. Apply soapy water with a small brush to all points where a leak is suspected. Bubbles will indicate escaping air. Steps must be taken to repair all defective joints, as an imperfectly sealed system is incapable of the delicate adjustments necessary to secure correct regulation.

After making certain the coils are airtight the system must be charged with the gas. Anhydrous sulphur dioxide may be secured in 6-lb. drums; this will be a sufficient quantity for a charge. Close valves D and B, and the air cock C; valves A and E are open, as is also the air cock F. Run the compressor for a time,

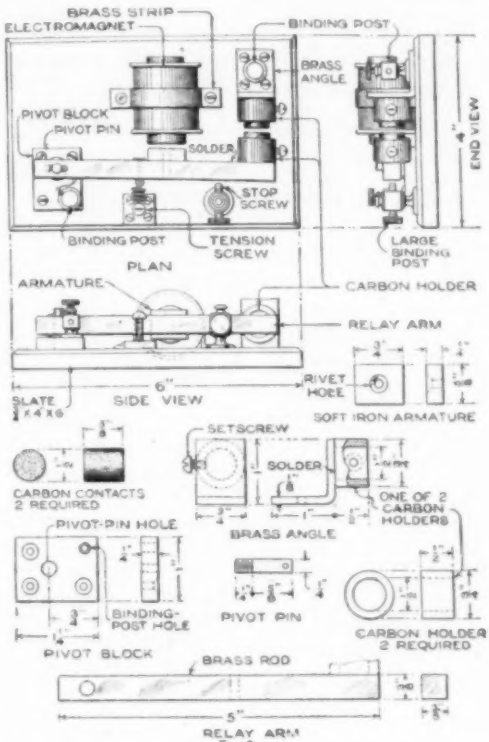


Fig. 6

The Relay Switch, Operated by the Battery Current through the Thermostat, Makes and Breaks the Motor Circuit

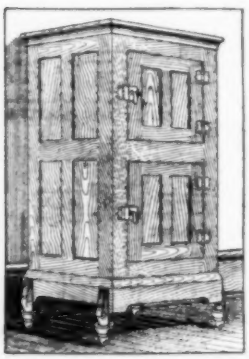
so that as much air as possible will be pumped from the pipes and expelled through F. Meanwhile, the outlet to the container of the gas is connected to the union attached to valve B. Quickly close F and A, and open D and B. The refrigerating fluid will be pumped in through the compressor to the condenser. Open cock C to allow the air to escape which is being replaced by the gas; close it when the gas appears. When the system is charged, close B and disconnect the empty gas drum. It should never be necessary to recharge the machine if B, C, and F are kept tightly closed so the gas cannot escape. Both the valves D and A will now be kept permanently open, no further adjustment being necessary after the system has been charged.

While the compressor is running, adjust the expansion valve E. No definite

directions can be given for its manipulation. Endeavor to obtain a setting which produces the maximum cooling effect in the expansion coils. Watch the action of the thermostat, and compare it with the thermometer readings. Make adjustments of the contact points until the relay is connected in the circuit when a thermometer placed in the food compartment shows a rise to 50° F. On the other hand, the thermostat should release the relay and allow the machine to stop when the temperature in the same section has dropped to about 45° F. If about 1 in. of water is placed in the ice pan, it will freeze, provided the machine is allowed to operate a sufficient time to bring the surrounding air to the freezing point. After the system is once adjusted, it should require no attention aside from occasional oiling of the moving parts.

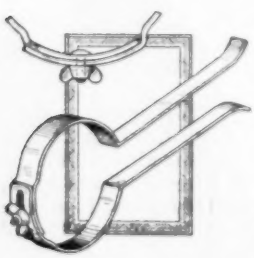
Glass Insulators Keep Insects from Refrigerator

An efficient method of keeping ants, and other insects, out of the refrigerator is to mount it on legs made of common telephone-line insulators, screwed on the brackets made to be used with them. The hollow part of the glass insulator is then filled with some liquid, like kerosene or turpentine, which the insects will not cross. Another advantage of such legs is that they are adjustable in length, so that the height of any one of them can be changed slightly to make the ice box stand steady on the floor.—J. G. Zimmerman, Chicago.



Adjustable Tongs for Holding Piston Rings

The tongs illustrated can be used on various sizes of pistons by loosening the wing nut, fitting the tongs over the piston, and again tightening the nut. One of the members of the tongs has a long slot cut in it, while the other has only a hole for the screw, or bolt, on which the wing nut is placed. Both members should be slightly offset, as shown, to give clearance for the head of the bolt.—L. B. Robbins, Harwich, Mass.



Carpenters' Squares Useful for Measuring Distances

A little ingenuity is sometimes necessary in measuring distances between shafts and other parts of a plant installation. Intervening gears, frame members, and other obstructions, may prevent a scale or tape from being stretched across the space to be measured, but a pair of carpenters' squares will solve most of these problems, if a very slight knowledge of geometry is applied.

In Fig. 1 of the illustration, the vertical distance between two shafts is measured without the aid of a level or plumb line, although the center lines of the shafts are not in the same vertical plane.

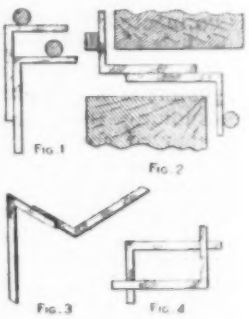


Figure 2 shows a method of overcoming a difficulty caused by two obstructions which prevent measurement from being taken more directly.

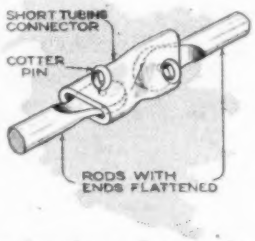
In Fig. 3, the edge of one square is held against the flat of the other, a convenient arrangement when conditions are a little complicated, as when it is desired to find the vertical or horizontal distance between points on flat surfaces which are not in parallel planes.

Figure 4 shows how a rectangle may be formed, by holding the tongues and blades of both squares against corresponding graduations on each.

In all these cases the length of the distances measured is of course limited by the size of the squares, but when yardsticks, straightedges, and additional squares are used, the most difficult conditions can generally be overcome.—J. E. McCormack, Haliburton, Ont., Can.

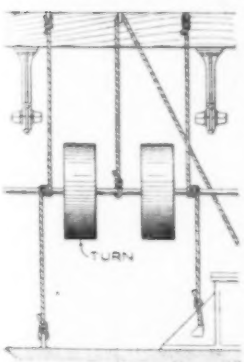
Universal Joint for Light Connections

Very little equipment is needed in the construction of a universal joint, strong enough to be used on light rods and shafts which are not subjected to much strain. Flatten the two rods at the ends which are to be connected. Cut a piece of tubing, 2 or 3 in. long, and flatten both ends in such a way that the longer diameters at the respective ends will be at right angles to each other. Insert the flattened ends of the rods at the opposite ends of the pipe, and drill a hole at each end, passing through both pipe and rod. The holes should be just large enough to admit cotter pins, which are afterward inserted, and the joint is then complete. It is necessary, of course, in selecting the tubing, to find one which will allow the rods sufficient side play after connections have been made.—G. A. Luers, Washington, D. C.



Heavy Countershaft Raised without Tackle Blocks

A heavy countershaft had to be hoisted into its position near the ceiling, and no tackle blocks were handy. The diagram shows the method by which this was accomplished. The countershaft was laid on the floor beneath its hangers, and ropes were fastened tightly around both ends, as indicated. The workmen then took hold of the near side of the pulleys on the countershaft, and pulled down, thus rotating the countershaft. As the rope was wound around the shaft, the latter was thus slowly raised into position. To prevent any chance of an accident caused by a loosened hold on the pulleys, the shaft was held from falling by another rope tied to the middle of the shaft and caught around some fixed object in the shop.—Edw. M. Davis, Philadelphia, Pa.



Tool Removes Incandescent Lamps

The spring socket made of wire loops, with which incandescent lamps are removed from high ceiling fixtures, needs extra equipment when the globes are to be removed from high horizontal sockets, such as those in electric signs. A semicircular band of galvanized iron is fastened to the top of a pole to form a bracket, or bearing, and the shaft holding the wire socket is run through it, with a heavy spool attached to the other side of the bearing. Strong cord, or fishline, wrapped around the spool, turns the wire socket and unscrews the globe.—William Freebury, Buffalo, New York.

Platform to Avoid Treading in the Garden

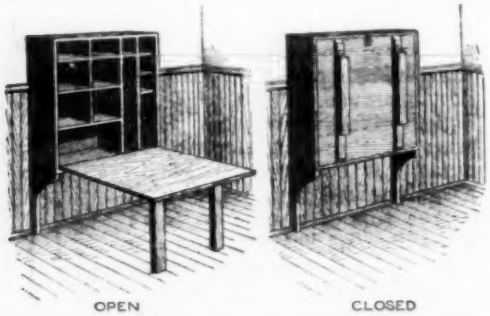
To form a platform, by means of which a gardener can avoid treading on the soil, a plank can be rested on two inverted flowerpots. The gardener stands at work on the improvised bridge, moving it from place to place as required.

Rubber Shaving Brush

To lighten his traveling kit, a tourist made a shaving brush out of a 10-cent rubber sponge. He divided it across the middle with a knife and used one of the halves, squeezing part of the material where the cut had been made until it was narrow enough to form a handle, after which he wrapped it tightly with fish cord. The other end, which had now become heart-shaped, made a convenient surface for applying lather, and the fish cord wrapped around the handle kept the material inside it completely rigid. In addition to its extreme lightness, the brush had the advantage of being thoroughly sanitary and free from anthrax germs, which sometimes infect bristle brushes.

Folding Bench and Tool Box

Time consumed in carrying tools between locker and bench, when simple jobs are being done, is saved if the tool box



A Bench and Locker Combined Reduce the Time Required for Transportation of Tools

is equipped with a combination bench and door, attached by hinges to the bottom. Legs are placed at one end only, as the other end is supported by the box; these will be strong enough if made of 2 by 3-in. lumber and fastened by small hinges to two braces, or cleats, which run the length of the bench. When the box is closed, the legs fold up against it and take up very little room.—Dale R. Van Horn, Lincoln, Neb.

Aids in Photographing Machinery

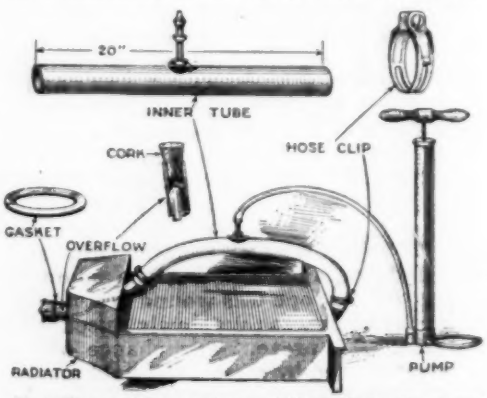
The advertising value of half-tone illustrations in machinery catalogs depends so much on the expensive retouching process that it pays at times to lay color on the machine itself, particularly when it is too large to be moved into a position where the lighting will guarantee a good negative. Only gray paint is used, and if applied in varying shades it gives complete definition to surfaces lying in different planes which would otherwise blend on reproduction, yet does not impart an illogical appearance to the shadows. The color should be laid on immediately before the plate is exposed, so that it will not have time to be defaced by finger marks, and when removed immediately afterward, it gets no chance to dry. Instead of coating the surfaces the outlines may be strengthened with chalk, whitening high lights, emphasizing name plates, and making the retoucher's work extremely simple or absolutely needless. On very large machinery the eminences and depressions are capable of individual illumination with incandescents, but the lamps must be carefully kept out of the field of view. Even with these aids to clear definition, the work should be done when the sunlight is strongest, and all windows behind the subject should be completely screened.—Adapted from British Journal of Photography.

Strength of Concrete Increased by Rodding

The strength of concrete is much impaired if entrapped air and excess water are not given some artificial means of escape while the material is setting. The process called "rodding" is the most effective. An iron rod worked up and down in the mixture makes passages which provide an exit, the operation being repeated until the material is too firm to permit its continuation. Experiments have been made with concrete containing about six sacks of cement per cubic yard mixed with about 10 per cent of water, and the result showed an increase of 100 per cent in strength. A laboratory test was also made, showing that, after seven hours of the treatment, specimens of concrete developed enough strength in 28 days to resist a weight of 4,644 lb. per square inch, whereas exactly similar specimens of the same age, which had not been rodded, could not resist a weight of more than 1,962 pounds.—Jack Rodolph, Austin, Texas.

Testing Repaired Auto Radiators

A dependable test of a repaired automobile radiator can be made by using part of a discarded inner tube with the valve



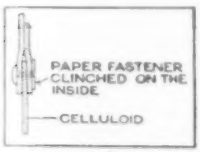
Air is Pumped into an Automobile Radiator Immersed in Water, and Rising Bubbles Show the Presence of Leaks

stem attached. Cut a circular gasket from another part of the tube, place it under

the radiator cap to make an air-tight joint, and plug the overflow pipe securely with a small bottle cork. Attach the tube with hose clips to the inlet and outlet nozzles, lay the radiator in a large tub of water so that it is completely covered, and inflate the tube sufficiently to cause a slight pressure in the radiator tubes, but not enough to injure them. If there are any leaks in the tubes, they can be located by rising bubbles, as the air has no other means of escaping if the other exits have been made air-tight. Mark the leaks with chalk, or with small pieces of wire twisted around them, and, after soldering, replace the radiator in the tub for another test. One or two repetitions of the process will be sufficient to detect all the leaks, no matter how small.

Paper Clips Fasten Windows in Auto Tops

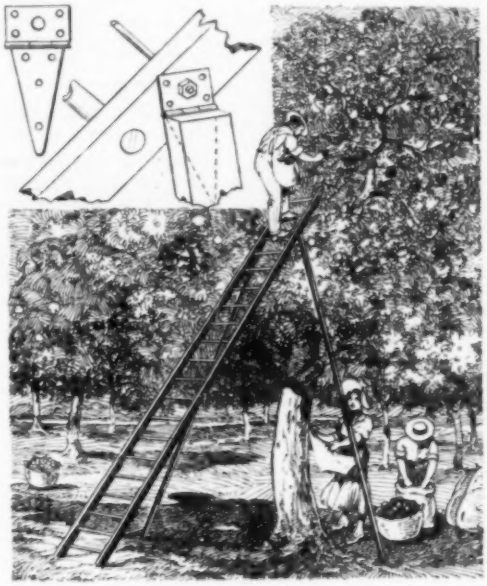
Stitching a new celluloid window in the curtain of an automobile top is a long and tedious job, and demands the services of two persons. Their labors will be much reduced if they use ordinary paper clips. The new piece of celluloid should be cut to the size of the old, and the edge slipped into the slot between the curtain and the reinforcing border, after the inner row of stitches has been removed. Punch holes with a pocket-knife through the celluloid and cloth, and pass the clips through from the outside, clinching them on the inside. The heads of the clips are then painted with enamel of the same color as the cloth.



Self-Supporting Ladder Useful for Picking Fruit

A ladder which does not depend on the limbs of the fruit tree for support will soon save its small cost in fruit which would otherwise be damaged by being bruised or shaken off through the use of an ordinary ladder.

The device is made from a common ladder of appropriate length, by the addition of two hinged legs. These are provided with sharpened points at the bottom (preferably pieces of iron screwed on), and the feet of the ladder must be similarly sharpened. A pair of hinges of the type shown have their long ends screwed to the upper ends of the legs, and the butt ends of the hinges have a hole drilled in the center to take a long ½-in. bolt. The



The Fruit-Picking Ladder is Supported Somewhat Like a Stepladder, but Has Greater Stability, Owing to the Legs Spreading Apart at the Bottom

nuts on the ends of this bolt must be locked by riveting or some other means, so that they will not come off, but will still allow the legs to be folded up parallel with the ladder when not in use.

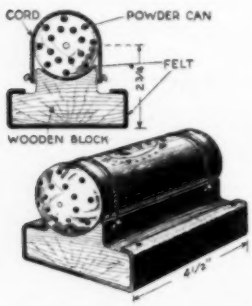
By varying the position of the legs, one may reach any part of a fruit tree, especially the outer ends of the higher branches, which are difficult to get at with ordinary ladders.—George E. Walsh, New York, N. Y.

Chip Catcher on Bit Brace

Among a carpenter's troubles may be counted the annoyance of having chips and sawdust fall down upon him when using a brace and bit over his head. A lamp shade attached to the brace will catch them, and, if not too large, will not prevent the carpenter from seeing how his work is progressing.

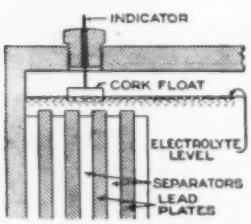
Draftsman's Powder-Can Holder

If the cloth, or pad, which is used to rub powder on the surface of tracing cloth, is combined with the powder can, the two will always be found together, and this will eliminate one of the small inconveniences well known to draftsmen who work in large departments. A wooden block should be hollowed out a little to make it fit the convex surface of the can. An elaborate job is not necessary, and the work can be done with an ordinary pocketknife. Elastic bands have been used to fasten the wood to the can, but as the latter does duty as a handle, it is better to attach wire, or cord, to wood screws, or nails, driven into the wood on both sides of the can. The block should then be padded with cloth or felt. A blackboard eraser, already padded, makes an excellent block on which to mount the can.—E. A. Van Deusen, Charlotte, N. C.



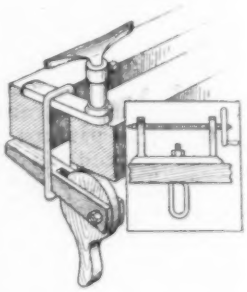
Float Indicates Level of Storage-Cell Electrolyte

Filling the several cells of his storage battery to the proper level with distilled water is one of the periodical tasks of the motorist. If the level is allowed to fall too low, serious danger to the plates may result; but sometimes the motorist may drive many days, or weeks, without appreciably lowering the battery level, while again a long, hard drive in one day may cause considerable evaporation of the water. It is thus advisable to inspect each individual cell quite frequently. Ordinarily, this is done by removing the cap of each cell and looking at the liquid below. The procedure takes some time, and is rendered unnecessary by the device illustrated. This is merely a float, made of a flat piece of cork, with a rod running upward, consisting of a piece of small-diameter graphite, taken from a hard lead pencil. This runs up through the vent hole in the cell cap. When cut off to the proper length, the stems of graphite will form indicators to show whether the battery cells are in need of more water. A good way is to adjust the length of the stems so that when the float is resting on the plates, the top of the indicator will be flush with the surface of the cell cap. Then notice the height of the indicator exposed when the battery cell is full, and the state of the cell can afterward be judged by a glance at the indicator.—Leon A. Haloin, Denver, Col.



Levers Replace Nuts on Lathe

The time required to loosen and tighten various nuts and hand screws on a lathe amounts to a considerable total. Some of this can be saved on wood-turning lathes and speed lathes by using cam tighteners, where practicable, instead of screws. In the illustration, the lathe rest is clamped tightly by pushing down on the cam lever at the bottom, and is quickly loosened by pulling forward and up on the cam lever. The eccentricity of the pivot hole in the cam is exaggerated in the drawing, to make clear the working of the cam lever.—T. J. Hubbard, Mendota, Illinois.

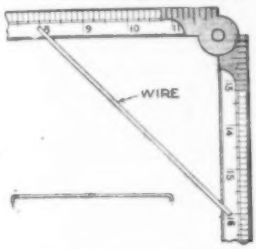


Dressing for Auto Tops

Automobile tops made of artificial leather are apt to crack, if the castor oil used for flexibility dries out of the composition. The result is a leaky top, and some of the varnish gums on the market do not always make the repair job a permanent one. A reliable preparation is made as follows: Mix 1½ oz. of castor oil with ½ gal. of solvent made of equal parts of amyl acetate and denatured alcohol; dissolve in this 4 oz. of colorless transparent-celluloid clippings. If the top is to be colored black, add aniline dye soluble in alcohol. The celluloid clippings can be obtained at any automobile-repair shop, where this waste accumulates. A reasonable degree of caution must be exercised in handling the chemicals, as they are highly inflammable.

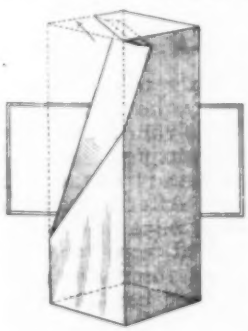
Folding Rule Converted into Square

The workman who wishes to carry with him a tool that can be converted at short notice into a square, has only to fit into his folding rule a piece of wire, bent to a right angle at the ends. Two holes are made in the rule to take the ends of the wire, and these must, of course, be located quite accurately, in order to form a useful square. A good way of doing this is to lay the rule, opened to a right angle, within the angle of a carpenter's square; lay the wire on the rule, and strike both ends a few taps with a hammer, thus marking the points on the wood where holes should be drilled. After these holes are made, the accuracy of the right angle should again be tested by fitting it against the steel square, and any error may be corrected by carefully bending the wire. One end of the wire may be attached permanently to the rule, or the wire may be taken off and carried in the pocket beside the rule.—D. J. McKean, Alameda, California.



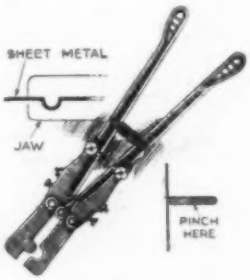
Wood-Turning Tool for Lathe

It is occasionally necessary to turn up a piece of wood in the metal-working or engine lathe. This can be done quite satisfactorily if the lathe is put on one of its higher speeds and a special tool is used in the tool post, ground as shown in the sketch. The tool should be set so that about the middle of the slanting cutting edge is level with the center line of the spindle. It is fed in the direction indicated by the arrow. The tool is designed for ordinary soft and fairly hard woods; but when working with extremely hard varieties, such as ebony, lignum vitæ, and similar materials, a tool more like a metal-cutting tool should be used in order to insure the best results.



Sheet Metal Joined without Rivets

For joining sheet metal together, false rivets, made by simply pinching the seam into a distorted form at certain spots, can take the place of some of the actual rivets which would otherwise be necessary. A tool for doing this false riveting is readily made from a common bolt cutter, by welding onto the jaws a small punch and drawing die. With this tool, the seam is pinched at intervals, drawing the metal out to what looks, from one side, like a round rivet head.—B. W. Butler, Truman, Minn.

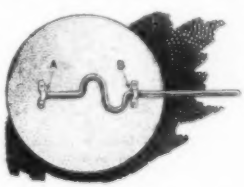


A Wire Hoe for Garden Use

The delicate work necessary in cultivating vegetables is done better by substituting for the hoe a small, light tool which can be used with one hand. The triangular head is made of heavy wire, and a stick of any convenient length serves as a handle for the tool.

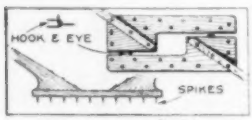
Firm Fastening for Damper Shaft

A damper, which had worked loose on its square shaft, was mounted, instead, on a round shaft bent to an S-shape, which held it much better than the square one had done. The distance AB on the shaft must be made less than the distance between the two straps on the damper, so that the shaft can be inserted under strap B, then pushed forward under strap A, and finally fastened with a cotter pin set through a small hole previously drilled through end A.



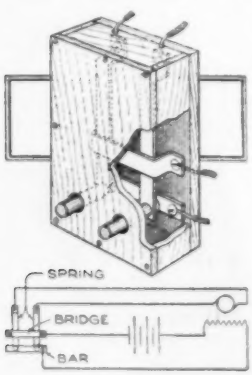
Cultivating Ground around a Tree

Fruit trees thrive better if grass is prevented from growing around them and drawing nourishment from the soil. The owner of an orchard had so many trees that the labor of cultivating the soil around each of them took up too much of his time; and accordingly he constructed a tool which enabled him to rake the earth on all sides of the trunk with one movement of the hand. Thin boards with heavy nails driven through them were so contrived that when two of them were hooked together they formed a rectangular harrow completely inclosing the trunk. Handles fixed at opposite corners enable the entire work to be done without stooping, or two men to handle the tool, thus securing greater speed.—A. S. Thomas, Amherstburg, Ont., Can.

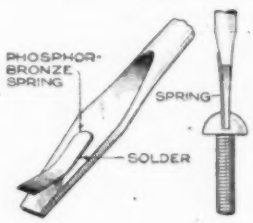


Push-Button Reversing Switch

An interesting type of reversing switch, or key, is applicable wherever a circuit is to be closed only during a short interval, but must be closed in opposite directions. Such a case would be where a motor is used for raising and lowering a curtain, or moving any object back and forth. Normally, both springs are in contact with the bridge which passes over them, and to which one of the connections is made. Either spring, when depressed, breaks contact with the bridge and makes contact with the bar below it, to which is connected the other wire from the battery, or power mains. The two springs are connected to the motor, or other device to be operated. It will be noted that pressing the button to the left closes the circuit in one direction through the motor, and pressing the one at the right closes it in the other direction. There is no possibility of a short circuit, since, if both buttons should be pressed at the same time, the circuit remains broken.—Thos. W. Benson, Philadelphia, Pa.



A Screwdriver with Spring Grip



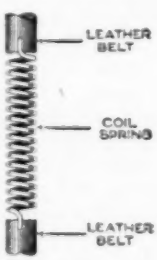
Soldering a small, flat, phosphor-bronze spring to a screwdriver blade, as shown, produces a tool which will hold the screw firmly for starting.

Countersinking Special Shapes with a Twist Drill

For countersinking irregular-shaped holes in metals, it is often thought necessary to make quite expensive tools. This work can, however, be done with an ordinary twist drill. Grind both lips to the level or curve desired; then grind the cutting edge off one lip, so that it cannot cut. This dulled lip will ride around in the hole without cutting, and will steady the other lip so that it will cut smoothly and without chattering. A countersink of almost any shape can thus be made at a very small expense.

Coupling for Sewing-Machine Belts

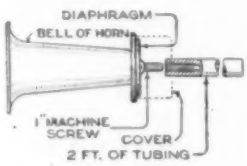
The weakest part of a sewing-machine belt is the joint made by the wire staple. The metal is generally so thin that it acts like a cutting edge, and eventually tears the leather. After it has been repaired once or twice in the usual way the belt becomes too taut to be of further use, but if a joint is made with a coil spring the same belt may be used indefinitely, since an elastic coupling will not subject the material at the hole to so great a strain as a rigid link. Many repairs can be made before discarding the belt, as repeated lengthen-



ing of the spring compensates for repeated shortening of the leather. The spring must, of course, be of the same diameter as the belt.—John P. Robinson, Santa Fe, N. Mex.

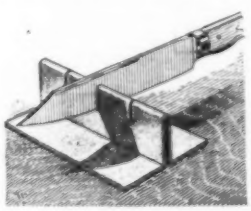
Old Auto Horn Locates Knocks

The sketch shows a quickly contrived instrument for locating knocks in automobile engines. A discarded automobile horn, a 1-in. machine screw, and a piece of metal tubing, 2 ft. long, are all the materials required. Everything is removed from the horn except the bell, the diaphragm, and the diaphragm mounting. The 1-in. machine screw is then soldered to the center of the back of the diaphragm. One end of the tubing is threaded to fit onto this screw. By placing the horn to the ear, and the end of the tube on various parts of the motor while it is running, the knocking can be easily and quickly located.—Ernest G. Roesch, Chicago, Ill.



A Kitchen-Knife Holder

Kitchen knives which are thrown loose in a drawer, besides being hard to find when wanted, are sure to take up too much room, and also likely to get their edges nicked by contact with each other. A very simple method of keeping them in order is to bend a piece of sheet aluminum to the shape shown in the sketch, saw a slot for each knife, and tack the aluminum piece to the bottom of the kitchen drawer. It takes scarcely any longer time to lay the knives in order in this rack than it would to throw them loose in the drawer, and their edges are thus protected from coming in contact with any iron or steel. Sufficient space should be left between the slots so that the knives can be seen and the proper one selected, when wanted. If only a part of the drawer is to be utilized for the knives, a wooden rail should be placed so as to divide off the space intended for them, and keep separate the articles kept in the other part of the drawer.

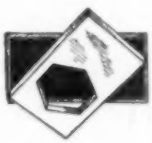


Handle for Carrying Paint Pots

Several paint pots can be carried with one hand if they are hung in a row on a rod. The hooks which support them are movable, and are held by setscrews at any position desired. If, therefore, the pots all contain different quantities of paint, the carrier can be kept in equilibrium by moving the pots nearer to or farther from the handle. This is a simple application of the principle of the lever.—James E. Noble, Kingston, Ont., Can.

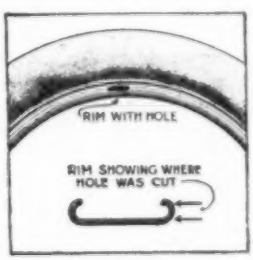
Socket Holds Bolts from Turning

A very small, but handy, tool in the auto-repair shop is a piece of sheet steel, cut to the shape indicated in the sketch. It is used as a wrench to hold the nut, or head, at one end of a bolt, while the other end is loosened or tightened. The advantage of the small piece over an ordinary wrench is that it will fit into many places where the ordinary solid wrench would not, and where perhaps the services of another man would be required to hold a socket wrench. Carbon steel, tempered low, is the best material for such sockets.—D. F. Healey, Holyoke, Mass.



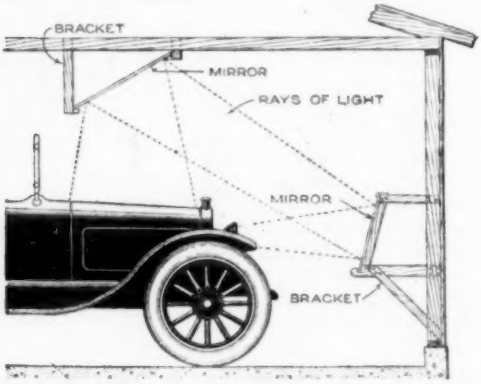
Hole in Rim Helps Remove Tires

In warm weather an automobile tire is apt to stick to the rim of the wheel, which makes it difficult to remove. This trouble can be avoided by making holes in the rim large enough to admit the tire tool, which is thrust through the hole and dislodges the tire. Each aperture is made by drilling small holes side by side and joining them together with a file. If the apertures are made about a foot apart, the rim will not be weakened enough to cause danger.



Garage Lighted by Auto Headlights

In a garage not otherwise provided with electric lights, the headlights of the car can be made to throw light upon the



By Means of Mirrors Properly Placed, the Headlights of the Car Throw a Powerful Light on the Engine

engine. Two mirrors are installed permanently in the garage, in the positions indicated in the diagram. The angles at which these mirrors are fastened, and the position of the upper one, must be determined by experiment, and the car must, of course, be stopped in the same place each time when the engine is to be illuminated by this method. The stray rays of light will ordinarily illuminate the whole garage sufficiently for lighting the way when starting out or returning from a trip in the dark.—C. D. Zellar, Oak Park, Ill.

Burlap Used on Poultry-House Nests and Roosts

By covering the fronts of poultry nests with burlap curtains, the nests are made dark, and therefore more attractive to the hens. They are also a protection against egg-eating, since the hens will not eat eggs lying in darkened nests. If they already have the habit, they can be broken of it by providing the nests with the burlap curtains. These curtains should fall to within 3 in. of the bottom of the nests, and each should have a V-shaped piece, 4 by 5 in. in size, cut out for air, and a small amount of light.

For nests used by sitting hens, the curtain should be made to cover the whole nest, a diamond-shaped piece being cut out for air and light. The curtains should be fastened with hooks, so that the hen may be released twice a day for food, water, and exercise.

Hens may be kept from roosting in the entrances of nests by tacking a narrow strip of burlap across the front. This provides a support which is too unstable for the hens to roost on. The nest is thus kept much cleaner, and the hens broken of their bad habit.

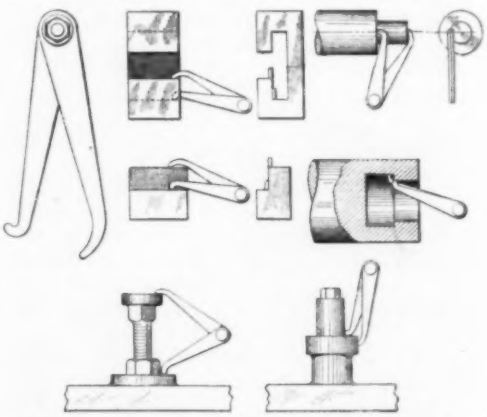
Roosting on the top of nests may be stopped by tacking burlap to the wall of the house and to the front edge of the nests, making a slanting roof upon which it is impossible to roost.—J. T. Bartlett, Ft. Collins, Col.

Protecting a Fence from Bulls

A vicious bull can do so much damage to farm fences by continually charging them that it is worth while to use some method of reinforcement. Set a row of posts, 3 ft. apart, about 4 ft. from the fence, to break the shock of the bull's charge. The posts, which can be taken from old fences, cost very little, and are an economical alternative to the expense of building a new fence.

A Caliper Distance Gauge

A handy tool in the shop is a pair of inside calipers, with one leg reversed as shown. One leg should have the end bent slightly upward and the other leg have the end bent slightly downward. It gives the advantage of being able to make caliper measurements when machining one surface a certain distance from another surface, either on flat or round work; it is useful for assembling a finished part a given distance from an edge,



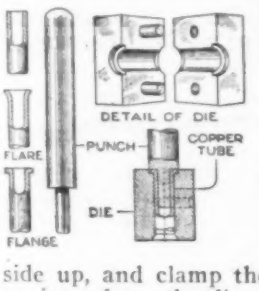
An Inside Caliper with Both Legs Turned the Same Way Forms a Handy Gauge for Many Jobs

undercutting surfaces or holes, measuring V-slots, and setting adjustable stops.

In all these and many other cases, some of which are shown, the mechanic has the advantage of "feel" as against scale measurements.

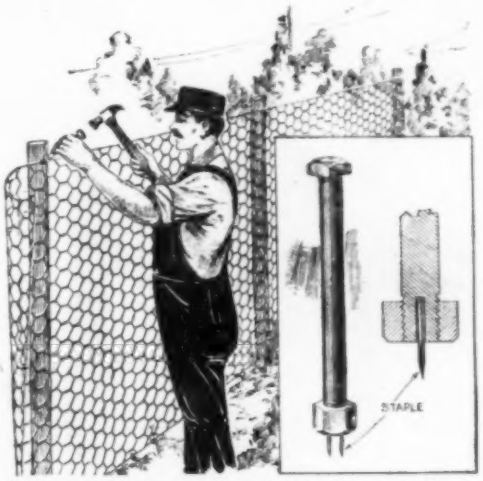
Punch and Die for Flaring Gasoline Tubing

For the couplings used with small brass and copper tubing in automobiles, it is usually necessary to form, on the ends of the tubes to be joined, either a flare, or a right-angle flange, as illustrated. A punch and die for doing this quickly by hand is not difficult to make. Two steel blocks are fitted together so as to slide on dowel pins, and a hole is drilled half in one block and half in the other, the same size as the tubing. The faces of the two blocks are then ground off slightly so that, when the blocks are fitted together and placed in a vise, they will grip the tubing firmly. One end of this die is countersunk to a 60° angle, as shown in the sectional view. The other end is counterbored square. In using the die, first set it in the vise with the 60° side up, and clamp the tubing so that it projects from the die about 1/16 in. Insert a common 60° center punch, and one or two well-adjusted blows with a hammer will produce the flare. If the right-angle flange is required, reverse the die on the tube, and drive in the special punch shown. This punch, like the die, will fit only one diameter and thickness of the tubing, but where there is a great deal of this work to be done with one size of tubing, the use of the punch and die may save much time. If durability is wanted, the parts should be made of tool steel and hardened.



Tool for Fastening Poultry Netting with Staples

Anyone who has fenced a chicken yard has felt the need of an extra pair of hands. The staples must be held in position while they are being hammered into the posts, and at the same time the netting must be held taut. With a long bolt and a nut, a tool can be made which enables one hand to hold the staple and stretch the netting, while the other hand is free to use the hammer. A 3/16-in. bolt, about 7 in. long, will suit the purpose. Run the nut on as far as it will go, saw the threaded

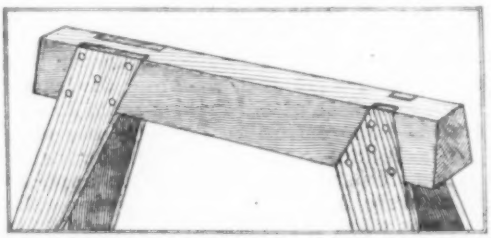


A Slotted Bolt for Holding Staples Saves the Hands of a Fence Builder from Injury

end off with a hacksaw close to the nut, and remove the nut. Cut a slot in the threaded end of the bolt, making it sufficiently deep and wide to hold a staple, after which replace the nut. The tool can now be used to hold the points of the staple against the post, and also to keep the netting taut, while blows from a hammer upon the head of the bolt drive the staple home.—M. L. Lowrey, Livermore, Calif.

Mounting Legs on Shop Trestles

Many shop trestles are built with legs attached as shown at the left. When a heavy weight comes on the trestle, the whole strain comes on the nails, and they are likely to loosen. If the legs are set in as shown at the right, the trestle will

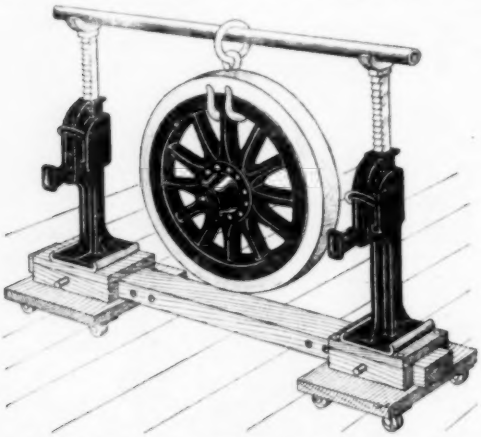


The Method of Attaching Legs as at the Right Results in Greater Strength of the Trestle, and Is Scarcely More Difficult to Carry Out

sustain a considerably greater weight without danger of being crushed.—E. K. Wehry, Cedar Rapids, Ia.

Jacks for Replacing Truck Wheels

Time and labor are saved in a motor-truck repair shop by mounting two jacks on a traveling platform when heavy truck



A Movable Platform and a Pair of Jacks Make Truck Wheels Easy to Handle

wheels are being replaced. Without effort, one man does a job which, under usual conditions, calls for three—two to lift the wheel and one to steady it. The platform is made by mounting two wooden bases on casters and connecting them by a yoke, or wooden link, which makes a sliding fit in the bases supporting the jacks. This makes it possible to change the distance betwen the bases and to use them for a variety of operations. Greater stability is obtained by making the bases wide enough to give abundant space between the casters. The jacks can be removed by sliding them out, and used for other purposes.—John G. Pope, Worcester, Mass.

Growing Giant Fruits

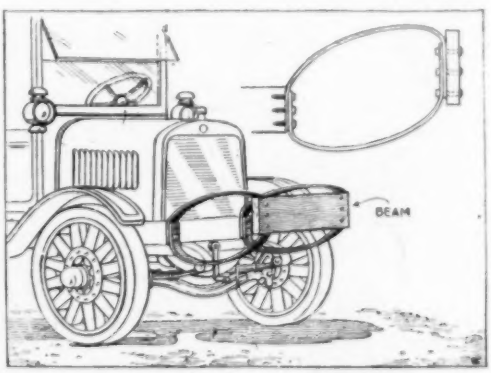
A remarkable way of securing giant apples and pears is to treat them with a solution of 24 grains of iron sulphate, to 1 pt. of water. It has been known for some time that the washing of leaves with such a solution enables them to absorb sap more freely. Recently the plan has been adopted in the case of the fruits, with astonishing results. Three applications were made in all. The first washing was when the fruits were about three-quarters grown; the second a month later, and the third when the specimens were almost fully developed. The solution was sprayed or washed over the fruits, either process appearing to be entirely satisfactory. The application was made in the evening when there was no likelihood of the sun striking the fruit for some hours. The fruits showed wonderful speeding up of growth after the first washing. In some cases, it was estimated that the rate of development was twice as fast as that of the untreated specimens. In the end, the fruit was larger and better in all ways. It was easy to discern from a considerable distance the difference between the treated and the untreated fruits.—S. Leonard, Bastin, Bournemouth, Eng.

File Cleaner Made from Rod

For cleaning lead, or solder, from file teeth, a piece of square copper, or soft-iron, rod is a handy tool. Cut the ends off square, and push the edge over the teeth in the same way as commonly done with a pine stick. Some pressure is necessary, to imbed the teeth in the edge of the rod. The eight edges of the two ends can be used for teeth of various degrees of coarseness.

Truck Bumpers from Auto Springs

Discarded 36-in. spring leaves were used in the construction of homemade bumpers to protect a fleet of coal trucks. Two pairs of leaves, bolted, as shown, to the front cross member of each truck, supported a wooden beam, 5 ft. long, 12 in. wide, and 2½ in. thick, which received the impact of any object that collided with the truck. The leaves were heated and bent into shape, after which the ends



At a Cost of Three or Four Dollars Old Automobile Springs are Made into Bumpers

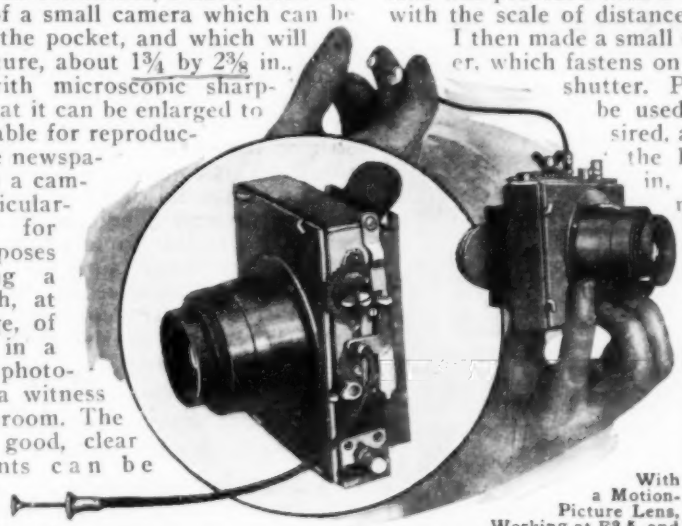
were drilled, with the holes at the ends of each pair corresponding. They were then retempered and installed on the truck in the position indicated.

Amateur Mechanics
Full information as to where to obtain materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

A High-Grade Miniature Camera

By G. R. WATSON

As a newspaper photographer, working under all conditions, I have often felt the need of a small camera which can be carried in the pocket, and which will take a picture, about 1¾ by 2⅜ in., focused with microscopic sharpness, so that it can be enlarged to a size suitable for reproduction in the newspaper. Such a camera is particularly handy for such purposes as making a photograph, at close range, of a person in a crowd, or photographing a witness in a court room. The fact that good, clear enlargements can be made from very small negatives is apparent from the consideration of motion-picture films, where a negative, ¾ in. by 1 in., is enlarged on the screen to perhaps 12 by 14 ft., with little sacrifice of definition, and with great depth of field. Remembering this, I decided to make a small camera which would take high-quality negatives, so as to permit reasonable enlargement without the loss of clearness.



With a Motion-Picture Lens, Working at F3.5, and a Roller-Blind Shutter, Giving Speeds up to One-Hundredth Second, or Faster, This Little Camera Makes Pictures of Such Accuracy That They can be Greatly Enlarged without Loss of Sharpness

The first requirement for such a camera is a fast lens of good quality, since the exposures must be very short, in order to preserve accurate definition. The focal length of the lens must, of course, be short, so that the entire camera will be of pocket size. With it a very fast shutter must be used. These requirements I met by using a motion-picture lens of 3-in. focal length, capable of a speed of F 3.5, together with an old focal-plane shutter. I made a collar, or jacket, of brass, about 2¼ in. long, with a flange on both ends; the lens to screw into one end, and the other to be screwed onto the shutter. The lens was provided with a focusing mount, with the scale of distances marked on it. I then made a small film-pack adapter, which fastens on the back of the shutter. Plate holders can be used instead, if desired, and grooves, for the holders to slide in, would then be made on the back of the shutter, the back being first covered with felt or plush, to make it light-tight. Preferring, however, to use film packs, I made a pack holder of brass — a little tray-like device that screws on behind the shutter, with one end left open in order to admit the film pack, and furnished with springs on the inside to hold the film pack tight against the plush-covered back of the camera or shutter. Two other springs on the side of the film-pack holder slip over the film pack when it is inserted, and hold it in position. The lens is supplied with a cap which must be put over it between exposures, to keep out the light while rewinding the shutter.

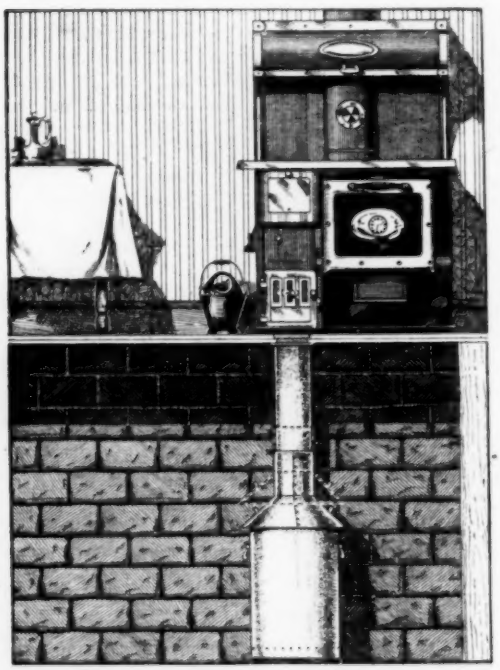
It is very important that the lens be properly adjusted so that the distances on its focusing scale will be correct, since an error of a small fraction of an inch in a lens of such short focal length will make a big difference in the sharpness of the image. To make this adjustment, put in a ground glass in the exact position which will be occupied by the film or plate, and adjust the lens to its proper position, after which it must be fastened securely. If an error has been made in this adjustment,

it will be apparent from the first few pictures taken, and can then be corrected.

The advantage of the short-focus lens, besides the possibility of carrying the camera in the pocket, lies in the greater depth of field which it gives. In other words, the shorter the focus, the nearer universal is the lens. It does not, however, do to have the focal length too short, as the distortion in perspective may then be too great. In my experience, the 3-in. lens is ideal for this type of camera. With this outfit, a good-sized head and shoulders can be taken at a distance of 3 ft. Flash-light exposures can be made with a very small charge of powder, owing to the large aperture of the lens. I have used the camera for professional work on a large city daily newspaper, and have made many pictures with it which would have been impossible to take with a large camera.

Ash Chute Saves Steps in the Kitchen

To empty ashes from the cookstove, the housewife is obliged to make many trips from the hot kitchen to the cold cellar, and in her overheated condition she runs the risk of taking a chill, besides losing time and energy in needless journeys. To prevent this, a metal chute can be made leading from the kitchen floor to the ash can in the cellar. Cut a hole, 7 in. square, in the floor in front of the stove, and nail strips of wood to the lower side of the flooring to support the cover which hides the hole when not in use. Cut a piece of 10-in. heater pipe, long enough to reach from the cellar ceiling to a distance of 2 ft. from the top of the ash can. Make four slits, 1 in. deep, in the upper end of it, and bend the metal over so as to make four flanges for fastening the pipe to the cellar ceiling. Make a galvanized-iron lid for the ash can, flat or conical in shape, preferably the latter, and connect it with the chute by a piece of piping, $10\frac{1}{2}$ in. in diameter, so that the chute may be a sliding fit inside it. This connecting pipe will be made solid with the lid of the ash can and will enter it through a hole in the top. This makes it possible to raise the lid whenever the can needs emptying, and to hold it up as long as necessary by thrusting a nail through two corresponding holes punched in the chute and connecting pipe.—Joe V. Romig, Allentown, Pa.



A Pipe Leading from the Cookstove to the Ash Can Lightens a Housewife's Labor

Breeze from Basement Cools Home or Office

A large bank office in an eastern city was kept cool and airy all summer without the annoyance of noisy fans. The means used was a 2-ft. motor-driven blower, placed in the basement and having suitable air ducts leading to various parts of the banking rooms. The blower was driven by a 5-hp. electric motor, and the air conducted to the floor above by means of 6-in. tin ducts. Smaller ducts opened into ordinary speaking-tube mouthpieces, located at convenient places at each cage and near each desk. Air valves were inserted near the mouthpieces, so that the occupant of each cage could regulate the air supply to suit his personal convenience. The result of this system was sufficient cooling with no noise and no annoying drafts.

A similar arrangement without a blower is used by a private family in their home. The grade entrance to the laundry is left open, which admits a breeze into the basement. The cool cellar air immediately travels up the air pipes, and as the first-floor doors and windows are kept closed and the upper windows are left open, all the warm air in the house rises to the top,

where it finds an exit, and the cool air continues upward from cellar to roof in a steady stream. By using a fan in the basement, the system could, of course, be made more effective.

Making Dry Barrels Water-Tight

Wooden casks that have dried and begun to leak are repaired by being soaked with water until the wood swells and stops the leaks. The usual method is very slow and laborious. Water is poured into the cask and renewed as fast as it runs out, until the leaks close, but the cask has to be refilled so often that a less tedious method is a real necessity. Stuff the cask with straw and place a large stone on the top. Saturate with water, and the straw will retain enough moisture to swell the wood after the water has escaped.

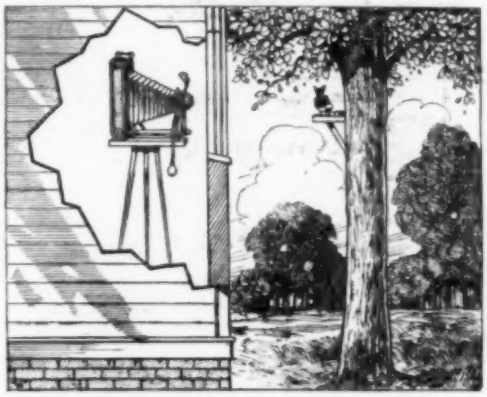
Making Gates of Old Metal Beds

Gates for garden or yard have been made cheaply from old iron beds. For the single gate, on the left of the illustration, only the bed spring was used, which in this case was of steel fabric. It was braced at the corners, after which a few ornamental touches were added, according to the maker's taste, by bending lengths of 3/16-in. strap iron into scrollwork.

For the double gate, a more decorative entrance was made by combining the head and foot, which in this case matched exactly. When the two parts differ in design or size, it will be necessary to remove some of the original material until exact similarity is obtained, and then to add ornamental iron of the same design to both parts.

Perch Aids in Photographing Birds

Good photographs of small wild birds are hard to make because of the difficulty



Wild Birds Attracted by a Baited Perch Pose Unconsciously for Their Portraits

of getting near them with a camera. A perch fastened close to a window and baited with bread crumbs gives the photographer many a chance to make close-range exposures.—Violet Johnson, Rockford, Ill.

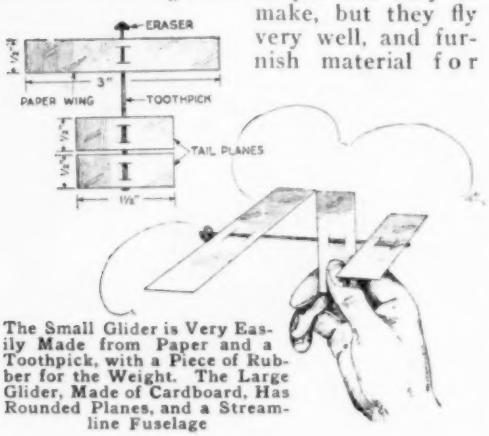
Repairing Snap Button of Glove

A glove button of the usual snap pattern is so liable to be flattened and made useless that it is handy to know how to repair it without using tools. Lay the flattened button over the socket and drive it in with an ordinary watch-chain bar, or other piece of wire, using a pocketknife as a hammer. The button again assumes the same contour as the socket, and if it becomes a little too sharp it can be slightly flattened by light taps with the knife.

With Metal Scrollwork and a Coat of Paint, Discarded Beds are Transformed into Garden Gates. In the Illustration at the Right, the Head and Foot are Used; in the Other, the Steel Bed Spring

Airplane Gliders Made of Paper

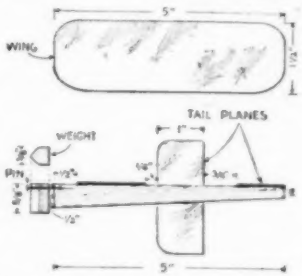
The two model glider airplanes shown in the drawings are simple and easy to make, but they fly very well, and furnish material for



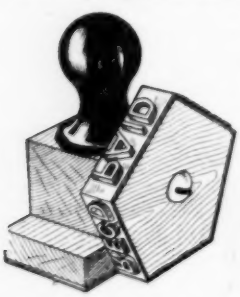
The Small Glider is Very Easily Made from Paper and a Toothpick, with a Piece of Rubber for the Weight. The Large Glider, Made of Cardboard, Has Rounded Planes, and a Streamline Fuselage

interesting experiments. Rather stiff writing paper can be used for the planes of the smaller glider. The three planes, when cut to the dimensions given in the sketch, are secured to a toothpick with glue. For a weight, a small piece of a rubber eraser is stuck onto the front end of the toothpick, without glue. Try the glider, holding it by the lower part of the middle plane, turned to a vertical position, starting it slightly upward, without using much force. It should glide for from 6 to 15 ft. If it drops quickly, it was not started properly, or the rubber is too heavy. If it turns upward, then falls, it was started at too great an angle, or the rubber is too light.

The larger glider is stronger, and is proportioned differently. It will do more "stunts" than the small one, and will fly farther, if properly made. Light cardboard, such as used for index cards or correspondence folders, is used for the planes, and photograph-mounting board, or other heavy cardboard, is used for the body or "fuselage." The planes are fastened to the fuselage with gummed labels or stickers. It will be necessary to split the fuselage for a short distance so that the central plane may be inserted. It is secured to the fuselage with stickers on both sides. The rubber weight is fastened to the front end of the fuselage with a pin. A sticker, placed around the end of the fuselage, will prevent the pin from splitting the cardboard. This glider is flown by holding it under the front plane, and starting it forward, and slightly upward. It need not be thrown with much force, but should be started with a gentle gliding motion. By bending the planes, the glider may be made to do many "stunts," such as flying upside down, starting sidewise, then righting itself.



An Adjustable Multiple Rubber Stamp

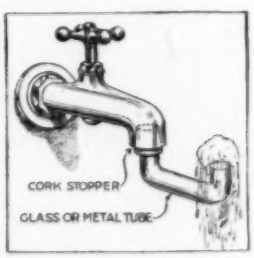


A handy rubber stamp can be made by mounting the original stamp face upon an extra block, to which is pivoted a block having five type faces. The stamp can then be turned to print any one of them.

¶An old hacksaw blade with the teeth ground off makes a good scraper. Bevel the edges, and finish on an oilstone.

A Temporary Drinking Fountain

Any domestic faucet can be converted into a drinking fountain by using a short piece of glass or metal tubing. The ends of the tube should be turned at a right angle for about 1 in., as shown, both ends turning in the same direction. Run one end through a cork large enough to stop the mouth of the faucet, thrust it in, and the fountain is ready.—C. S. Cierpik, Urbana, Ill.

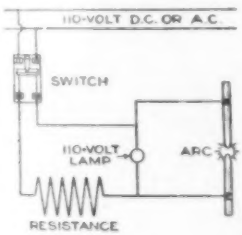


Sign Holders Made from Film Spools

In trimming a show window it was necessary to arrange a number of price tickets without attaching them to the articles to which they referred. No wire supports were available, but stands were improvised from discarded film spools. The flange was sawed off one end of each spool, and a small slot was made across the shank at that end. The spool was then set vertical, with the remaining flange at the bottom, and the ticket inserted into the slot.

Lamp Shows Position of Arc-Light Carbons

An incandescent lamp of low candlepower served as an indicator to show a moving-picture operator whether his carbons were the right distance apart. A 10-watt lamp, of the same voltage as the line, was connected across the terminals so that the lighting current passed through the resistance coils which were in series with the arc lamp. When the carbons were so far apart that there was no arc, the current was all diverted through the incandescent lamp, which then burned brightly. When the arc was formed, the lamp burned dimly, showing the operator that the carbons were the right distance apart; but when the carbons came into contact they formed a low-resistance path through which nearly all the current passed, and the lamp went out entirely.—John J. Carl, Greencastle, Pa.



Staining Wood with Cloth Dyes

The ordinary fadeless dyes cost much less than wood stain, and look just as well. Dissolve a 10 or 15-cent package in a pint of hot water and lay it on with a brush, applying a second coat if the first is not deep enough. A pint of water to a package of dye makes a good mixture, but the proportion can be graded according to the tone, or shade, desired. To make the color weatherproof, a coat of shellac may be added after the mixture has dried.

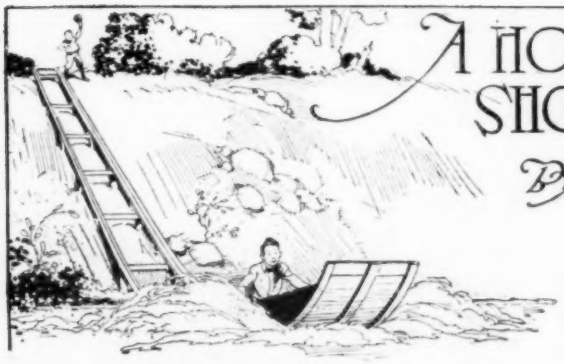
Trailer for Velocipede

Even among toys the vehicle which travels fastest is the one which holds preference, and a child's cart will be more appreciated by its owner if attached to a toy velocipede. Disconnect the rear wheels and axle of the velocipede from its frame and bolt the latter to the front axle of the cart, as shown. —Chas. A. Goddard, Los Angeles, Calif.

By Attaching a Velocipede to the Front Axle of a Child's Cart, a Trailer is Made Which Accommodates Several Passengers

Water Wings Made from Tin Cans

The boy who has access to some quiet stream where the water is 3 or 3½ ft. deep, but has no one to teach him to swim, may be able to pick up two empty tin cans of the friction type, having a cover which is pressed into a large hole in the end of the can. To these he may attach a stout but thin rag, about 18 or 24 in. long, by forcing on the covers of the cans with the ends of the rag caught under them. Or if two old varnish cans with screw top are handy, the rag may be tied to the handles of the cans, and the covers screwed on tight. The device is used like ordinary water wings, the cloth being placed under the breast or back. The cans support the body until the swimmer becomes familiar with the necessary movements. He should not venture beyond the depth in which he can safely stand up, until he has learned to swim without the wings.—Harold E. Benson, Boulder, Col.



A HOMEMADE SHOOT-THE-CHUTES

By L. P. Robbins

FOR boys who live near still water a shoot-the-chutes will furnish more thrills in one swoop down the track and onto the water than the ordinary boat furnishes all summer. The building of the structure is not beyond the average boy, and he should be able to earn whatever he spends on it by charging his friends a small sum for the privilege of sharing his thrills.

There should be a fairly steep hill for the track; it need not be over 75 ft. long. The water must be quiet and the current very slow; a spot should be selected where the water is not over 3 or 4 ft. deep.

The boat, shown in Fig. 1, is built as light as possible, so that it is easy for the boy to pull it back up the track after each trip. Two planed boards, ¾ by 12 in. by 8 ft., are needed for the sides of the boat. These are left full width at a point 3 ft. from what is to be the front, or bow, of the boat, and taper from this point to the back, or stern, of the boat, where they are 4 in. wide. In front, the sides curve gradually to the bow, where they are pointed. A pattern for this curved outline may be made by bending a light piece of wood between the two points; a line is then drawn along the edge of the stick to saw by. Both sides of the boat must be cut out exactly the same, and must have smooth, level edges.

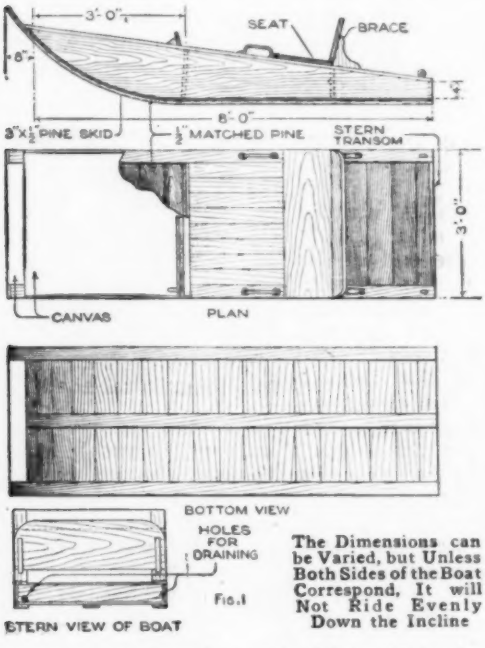


Fig. 1

The Dimensions can be Varied, but Unless Both Sides of the Boat Correspond, It will Not Ride Evenly Down the Incline

Place the boards on the floor with the straight edges down, brace them solidly 3 ft. apart, and fit in the stern piece, which is ¾ in. thick. Then make two partitions or bulkheads, to be placed as shown; the bottoms of these boards must have notches cut in them so that any water that gets into the boat will flow out at the back. It can be removed through two 1-in. holes bored in the stern piece, and fitted with plugs.

The bottom of the boat is of ½-in. matched pine, laid crossways. Thick paint should be flowed into the groove and onto the edge of the hull before the bottom boards are nailed on, as the joints must be water-tight. When this is in place, nail two skids of hard pine along each edge of the bottom, and nail a keel of the same material along the middle of the bottom. The two skids should be cut even with the stern of the boat, but should project somewhat at the bow. All nails must be carefully clinched on the inside of the boat.

When this is done, turn the hull over and fasten it with braces, so that it will not rock while the top or deck is being put on. Three strips, similar to the skids, are nailed to the edges of the hull and to the middle, running the entire length of the boat. The space between the two bulkheads is covered with matched pine, such as is used in the bottom of the boat. The rest of the deck is covered with 8-oz. canvas, stretched tightly and tacked along the top of the sides. The edges should be covered with a thin strip of molding, to keep the canvas from fraying. All should then be painted with at least four coats of good-quality paint.

The seat is a board nailed across the deck and fitted with a back rest, held

solidly in place by two brackets of wood, or iron. A pair of handles, such as are used on light doors, are screwed to the deck in front of the seat, for the rider to hold on to while making the descent. A ring bolt is placed in each corner of the stern, for the rope used in dragging the boat back up the incline. It will also be necessary to tack a piece of canvas to the projecting ends of the skids, to protect the rider from the spray.

The track is simpler to make, and is seen in Fig. 2. Two lines of posts, placed 3 ft. apart, are run from the water's edge to the top of the hill. The rails of the track are pine boards nailed, flat side up, on top of these posts. Care must be taken to have them spaced properly, and exactly in line over all the distance. The sideboards are guides which prevent the boat from leaving the track, and should be screwed firmly to the rails. The track should be curved gradually so that it is practically level where the boat strikes the water. A landing platform of some sort should be erected at the upper end, from which to make a start. Give the rails a thick coat of heavy grease, such as used for automobile transmissions or wagon axles. This should be renewed from time to time.

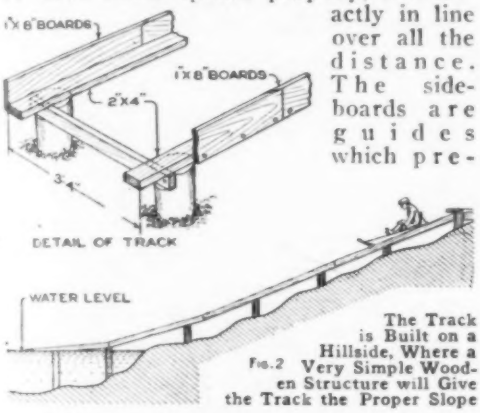


Fig. 2 The Track is Built on a Hillside, Where a Very Simple Wooden Structure will Give the Track the Proper Slope

When all is ready, place the boat on the rails, climb aboard, hold on tightly to the handles in front of the seat, and give the boat a little push to start it. It will gather speed at every foot, and will hit the water with a rush, barely skimming along the surface. It will be necessary to provide the boat with a canoe paddle, so that it may be propelled back to the shore.

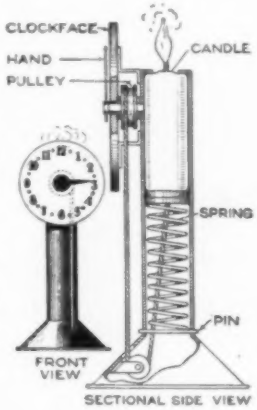
¶ A dished oilstone can be flattened on a sheet of coarse-grained carborundum paper tacked to flat wood. Finish on paper of finer grain.

Simple Car Heater Made from Sink Drain

Warm air rising from the motor and exhaust of an automobile provides sufficient heat to keep the driver comfortable even on very cold days. If a hole is cut in the front floor board over the exhaust and covered with a sink drain, warmth which rises through the perforations will be retained in the lap robe. Any sink drain will serve to cover the hole, but the heat can be regulated with great precision by using the type that is equipped with two disks pivoted at the center. The perforations on both disks correspond, so that by turning the upper one with a small knob the holes may be made to coincide, leaving the drain open. In any other position, the drain is partly or completely closed, and the heat can be regulated according to the weather.—Kenneth E. Lohman, Los Angeles, Calif.

Clock Operated by Candle

The practice of using candles to measure time is one of considerable antiquity, and even in these days, whenever extreme accuracy is not needed, a fairly serviceable clock can be made by connecting a dial with a candle, provided it can be made to burn evenly. The candlestick here shown is open at the bottom to admit a candle with a spring below it. The latter is held in position by a pin, and the dial pulley is attached to a cup or washer under the candle by a cord which passes around a pulley at the candlestick base. A little experimenting is necessary before a candle is found which will burn at the rate desired.—S. Leonard Bastin, Bournemouth, Eng.



Hall Rack for Children's Clothes

If children have no definite place to put their muddy shoes and outer garments, they cannot be blamed when they

A Rack for Children's Coats, Hats, and Overshoes Protects Both Carpets and Clothes

leave them in wrong places. A combination bench and rack, which can be made from a few 1-in. boards, will be a constant reminder if placed near the front door. Unless the family is large, the bench need not be more than 1 by 3 ft. If the top of the seat is 14 in. from the floor, there is room beneath it for a tray to hold shoes and rubbers.—C. L. Meller, Fargo, N. D.

Cattail Stems for Cheap Arrows

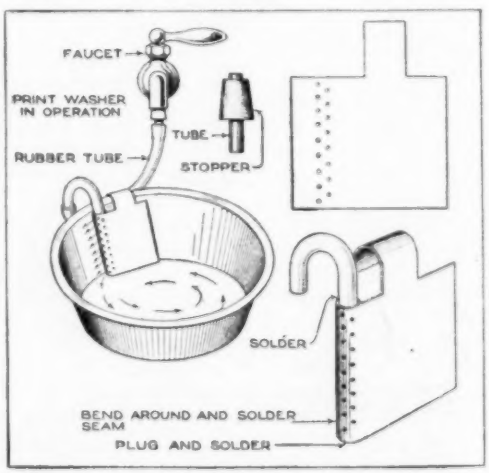
A boy who made a pastime of archery lost so many arrows that he was obliged to find a quick and cheap way of making new ones. He found an endless supply in a neighboring marsh where cattails were abundant. He cut a number of straight ones into even lengths and drove a shingle nail into the thick end of each. He then notched the smaller ends, and found on trial that they had nearly the same range as the best arrows procurable and could be used with great accuracy.

A Handy Fire Kindler

In order to light fires quickly a contrivance was made from asbestos and wire. A 2-ft. length of wire was cut, and 8 in. from one end, a loop was made, about 2 in. in diameter. Across the loop was laid a piece of asbestos, 2 by 3 in. in size, the remainder of the wire being wound back and forth over the loop to hold the asbestos in position. The asbestos was then dipped in kerosene, lighted, and placed under the fuel, where it started a good fire in less than three minutes, after which it was withdrawn by the 8-in. portion of the wire, which formed the handle of the kindler, and which had been left projecting from the grate.—Philip A. Wall, Bedford, Mass.

Whirling-Water Print Washer

Without a specially constructed tank with an aperture at each end, the amateur photographer finds difficulty in washing his prints after taking them from the fixing bath. It is not sufficient to change the water by letting the faucet run continually, as there is not enough movement in the tank to insure complete cleansing of the prints. For best results, the water must be kept traveling rapidly through the tank or around it, and the latter condition is obtained with any circular metal dish if it is equipped with the appliance shown in the illustration. It is made by cutting a piece of sheet copper or zinc, and punching two or three rows of holes at one end with a nail. This end is bent around and soldered in such a way that a blind alley is formed from which incoming water can only escape through the punched holes. A narrow piece of lead pipe connects it by a rubber tube with the faucet, and as the pressure of the water is concentrated against the perforated surface, it issues from the holes with



A Cheaply Made Appliance Keeps Photographic Prints from Becoming Clouded

great force, and causes the contents of the dish to whirl at high speed. A dish of earthenware or enameled ware should

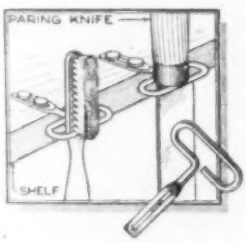
be used, so that the chemical action of the metal may not harm the prints.—J. G. Zimmerman, Milwaukee, Wis.

Muffling the Typewriter

A typewriter placed on a sofa pillow filled with balsam and spruce boughs will have its sound effectively muffled. The packing of an ordinary sofa pillow is of little use, as it becomes compressed by the weight of the machine; but with spruce or balsam boughs the noise is absorbed, and not transmitted by the desk and adjacent woodwork.—F. E. Brimmer, Syracuse, N. Y.

Tin-Can Keys Used as Racks

When a meat can has been opened the usefulness of the metal key is not at an end. It can be fastened with tacks, or nails, to a shelf, in a bathroom or over a kitchen sink, and used as a bracket to hold a variety of small domestic articles. It can also be nailed to a window sill, or projecting ledge over a shop bench, and made to hold small tools. The slot in the shank is wide enough to admit small nails, and though there is sufficient space in the head for a chisel, wrench, or screwdriver of ordinary size, it is possible to make room for larger articles by bending the wire into a slightly different shape.—Chas. H. Willey, Concord, N. H.



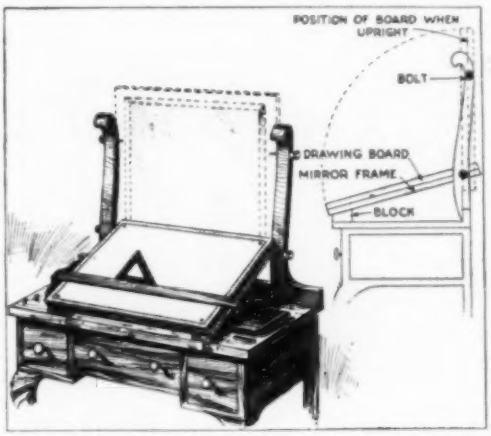
Pail with Valve Bottom for Bailing Post Holes

Considerable difficulty is encountered in keeping water out of post holes when they are being dug in swampy ground. An ordinary hand pump cannot be used, as the quantity of water necessary for priming is as great as the quantity in the hole.

A good method is to drill three holes in the bottom of a heavy galvanized-iron pail, and to solder over them three flat hand-pump valves. Drop the pail into the hole, and its weight will open the valves, allowing the water to run in. As soon as the pail is withdrawn, the weight of the water closes the valves, so that it is easily pulled up and emptied out.

Dresser Made into Drawing Table

By fastening a drawing board to the back of a dresser mirror a convertible drawing table can be made. The trunnion pins are moved from the center of the frame to about 3 in. from the bottom. Wooden blocks, under the edge of the board, on the table top hold it to the proper height and angle, and when the drawing board is not in use, the mirror is held vertical by bolts at the top of the frame, turning the table back into a dresser.—Edward C. Lagergren, Chicago, Illinois.



A Drawing Board Fastened to the Back of a Mirror Provides a Combination Drafting Table and Dresser

Fire Basket Kills Caterpillars

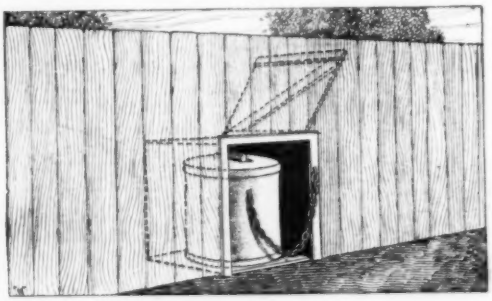
Caterpillars can be burned from trees very easily by using a pole with some wire screening on the end of it, formed into a cone-shape, and containing a piece of cloth soaked in kerosene.

Hole in Pie Tin Prevents Bubbling of Crust

When steam forms between a pie tin and the bottom of a one-crust pie, it forces the paste upward and gives the pie an irregular appearance. Bore one or two small holes in the center of the tin, and any steam that forms will escape.

Garbage Can Chained to Box in Fence

A family was inconvenienced by continual theft of garbage cans, and remedied the trouble by attaching the can to



A Chained Garbage Can in a Wooden Inclosure is Protected from Thieves and Practical Jokers

the alley fence with a chain, which was just long enough to enable the garbage man to empty the can. A hole was cut in the fence a little higher and wider than the can, and a box was built around it on the inside of the fence, with a hinged lid which could be lifted whenever it was necessary to dump refuse into the can. The box was open toward the alley so that the garbage collector could reach it, and was therefore not entirely protected from thieves and jokers, but the can was not nearly so conspicuous as formerly, and as a result it escaped theft and damage. In addition, it was out of the path of passing vehicles, and could not be crushed or knocked out of position by a wagon wheel. To screen it perfectly, a second lid could have been attached by hinges to the alley fence, the chain staple being set on the inside; but this was not found necessary.—Chas. A. Elliott, Philadelphia, Pa.

Smooth Backgrounds for Photographs

Amateur photographers often use shawls, blankets, or other dark-colored cloths, as backgrounds in their home portraiture. Since such portraits are usually time exposures, the texture and pattern of the cloth is easily seen in the resulting picture. This trouble is avoided by shaking the cloth slightly during the exposure, thus doing away with all detail in the background. Since it often happens that there is no third person present to shake the cloth, some way should be provided to enable the person taking the picture to agitate the background while making the exposure. A simple arrangement is to tie a stout cord to the pole from which the background is hung. Two or three sharp jerks on this cord during the exposure will prevent any details of the fabric from being visible on the print.—Hugo J. Engel, New Braunfels, Tex.

Coat Hook Carried in Pocket

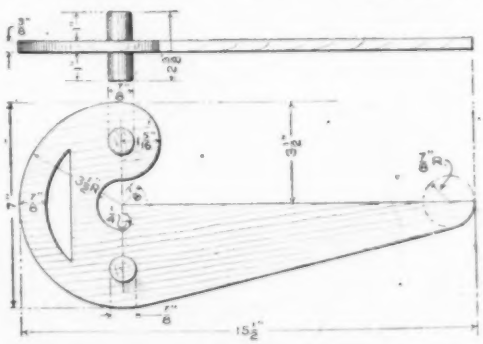
A student, who found that no place was provided to hang caps or other wraps in many of the classrooms, provided an emergency cap hook in the shape of a large glass-headed push pin. He carried this with him at all times, sticking the point into a cork, to protect his pocket. The pin can be used almost any place, and leaves no unsightly mark.

Embroidery Hoops Used as Frame to Display Flowers

An attractive window display may be arranged by stretching a piece of mosquito netting over a common embroidery hoop, which has been dipped in paraffin to make it waterproof. The flower stems are pushed through the meshes of the netting, and the frame is floated in a flat glass dish two-thirds full of water.—E. B. Warren, Garnet, Mont.

Tool Forms Combination T-Square and Center Square

A tool constructed according to the sketch may be used for the purposes of an ordinary T-square, but finds its principal use in marking the center of a round piece of wood. It may also be used by finding the approximate center of an uneven



A Center Square, for Use with Circular Objects of Diameter Up to Two Feet, can Also be Used as a T-Square

block of wood with irregularly curved edges. The dimensions given are suggested as those which will prove useful

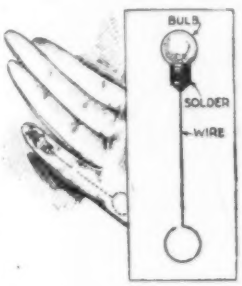
for many workmen; they can be varied as desired.—A. Handelman, Montreal, Canada.

Catching Cockroaches

Cockroaches are a great nuisance, and are sometimes found difficult to exterminate. By means of a simple trap a place may be cleared of these pests in a few nights. Four teaspoonfuls of honey, or sirup, should be stirred into a quart of water. This is put into a basin of such a size that it fills the vessel about half full. The basin is placed upon the floor, and a few small sticks, ½ in. wide, are rested upon its edge so that they project somewhat over the liquid. The other ends of the sticks rest on the floor. The insects climb up the stick, and, when they reach the end, tumble into the basin and are drowned.

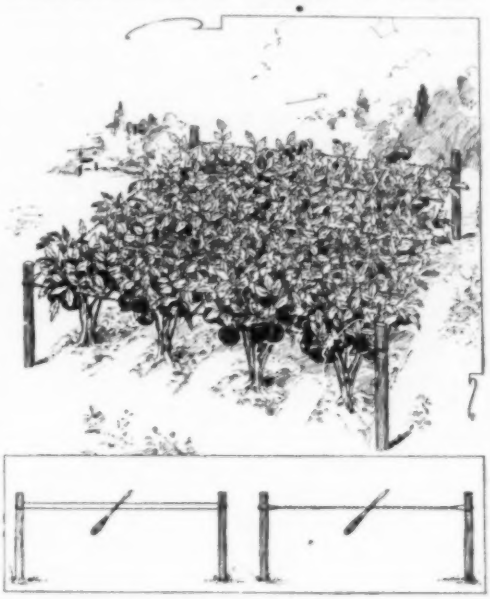
Lamp Bulb for Mending Gloves

It is not easy to stitch the torn finger end of a glove without spoiling its shape, unless some rigid material with a curved surface is kept inside it while repairs are being made. A burned-out bulb of an electric flash light is usually small enough, and is not too easily broken. Use one that is perfectly round, without the projecting tip that is found on some types, and solder a small piece of wire to the socket end to hold it in position.—Frank W. Bentley, Missouri Valley, Ia.



A Twisted-Wire Tomato-Plant Trellis

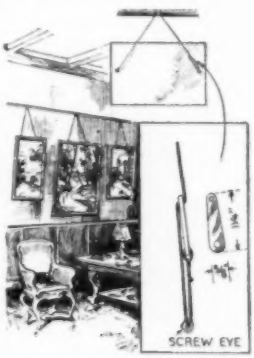
Tomato plants produce better fruit when the vine is held up off the ground by some sort of trellis. In fact, the fruit will ripen very much earlier, and be of better quality, if the plants themselves are set at least 3 ft. apart, and the rows the same distance, in addition to the use of a trellis. A few plants set in this way will outdo a larger number of plants set close together. The usual method of giving light and air space to the vines is to set a barrel hoop on stakes around the plant. A trellis, which looks better and gives better support, is made from wire twisted between posts at the corners of the tomato patch, with cross wires between the plants themselves. Since this need not be put in until the plants are too large to cultivate, it will not be in the way. The method of twisting the wire, to give tightness, is shown in the two lower sketches. —J. F. Campbell, Hudson, Mass.



A Trellis, Made of Wire Twisted between Corner Posts, Holds the Vines off the Ground, Giving the Light and Air Necessary to Produce the Best Fruit

Adjuster for Picture-Hanging

A grip or adjuster, of the kind commonly used on guy ropes, is a great convenience in hanging pictures. When it is desired to hang a whole row of them with the upper or lower edges of the frames in line, it is necessary to lengthen or shorten the cord of each picture two or three times before exact alinement is obtained. This is generally done by unfastening the cord from one of the screw eyes, but the device shown, which is easily made of hard wood or fiber, removes the need of detaching the cord.

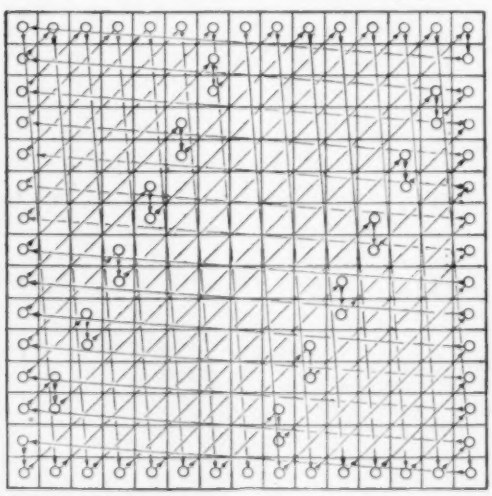


How to Make Magic Squares

One of the old mathematical curiosities is the magic square. By this is meant an arrangement of consecutive numbers in the form of a square, so that the sum of the numbers in each horizontal row is the same, and the sum of each vertical column, or of either diagonal, is the same as the sum of a horizontal row. Many such squares have been published; the finding of the proper arrangement by experiment is a tedious task, even for small squares, and for those of 10 or more columns and rows it is out of the question. By the use of the rule given below, it is easy to construct a magic square of any size desired. The rule is illustrated in the diagram at the left, and the square at the right illustrates the result of applying the rule.

The rule, which applies only to squares having an odd number of rows and columns, is as follows: Begin by placing the figure 1 in the middle square of the top row, and 2 in the bottom square of the next column to the right. Follow with 3, 4, 5, etc., running diagonally upward and to the right. When the last column is reached skip to the left side, still moving one square upward each time. When the space occupied by 1 is reached, drop down one space, and continue diagonally upward until the top row is reached. Write the next number in the bottom square of the next column to the right, and continue the diagonal movement, dropping down one square whenever an occupied square is reached.

There are also some interesting properties of the central row and the central column of the square, and of the number at their intersection, which in the 15-row square illustrated is 113. This number is the arithmetical mean between any two numbers an equal distance above and below it, or to the left and right of it, or at the same distance from it in either diagonal. This central number, multiplied by the number of rows or columns, gives the constant number which is the sum of all the numbers in any row, column, or diagonal.—Frank H. Jones, E. M., Clarkdale, Ariz.



122	139	156	173	190	207	224	1	18	35	52	69	86	103	120
138	155	172	189	206	223	15	17	34	51	68	85	102	119	121
154	171	188	205	222	14	16	33	50	67	84	101	118	135	137
170	187	204	221	13	30	32	49	66	83	100	117	134	136	153
186	203	220	12	29	31	48	65	82	99	116	133	150	152	169
202	219	11	28	45	47	64	81	98	115	132	149	151	168	185
218	10	27	44	46	63	80	97	114	131	148	165	167	184	201
9	26	43	60	62	79	96	113	130	147	164	166	183	200	217
25	42	59	61	78	95	112	129	146	163	180	182	199	216	8
41	58	75	77	94	111	128	145	162	179	181	198	215	7	24
57	74	76	93	110	127	144	161	178	195	197	214	6	23	40
73	90	92	109	126	143	160	177	194	196	213	5	22	39	56
89	91	108	125	142	159	176	193	210	212	4	21	38	55	72
105	107	124	141	158	175	192	209	211	3	20	37	54	71	88
106	123	140	157	174	191	208	225	2	19	36	53	70	87	104

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The Magic Square, in Which the Sum of the Numbers in Any Row, Column, or Diagonal Is the Same, may be Readily Made in Any Desired Odd Number of Rows and Columns, by the Rule Given

White of Egg Used as Emergency Lens Cement

While cleaning the lens of his camera, a photographer with whom I was recently detailed on a military assignment, accidentally dropped the treasured bit of glass upon the steel deck of the battleship. The lens was a high-grade anastigmatic one, and upon picking it up, we were much chagrined to find that the shock of the fall had split the crown glass away from the flint layers. Much depended upon the picture we had been sent out to take; if we were to obtain another lens, a period of four hours at the very least would be lost in procuring it, and the event we were to photograph was to take place in 30 minutes. Our only hope was in some emergency repair, and this was accomplished as follows:

The layers of crown glass and flint glass were washed with lukewarm water and soapsuds, and carefully dried. From the

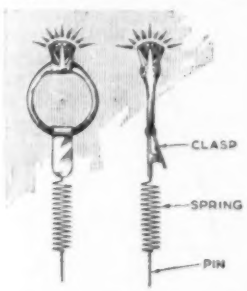
ship's cook we procured a fresh egg; using the white of this for a cement, we coated both layers of glass, and reassembled them in their barrel. Bubbles between the glass layers were almost entirely eliminated by screwing the threaded rings down as tightly as possible before the egg cement had time to dry. With this makeshift we secured pictures of good quality.—John Edwin Hogg, Alhambra, Calif.

Shellac Retips Shoe Laces

Shoe laces are often ruined because the tips pull off and the string frays out, making it almost impossible to lace through the eyelets. An easy way to repair the frayed ends is to dip them in thick shellac, twist them into the desired shape, and allow them to dry overnight. It may be necessary to trim off some of the frayed threads.—W. F. Corenke, Portage, Wis.

Diamonds Displayed on Spring Mounting

A jeweler, whose store faced a thoroughfare where traffic was heavy, noticed that the vibration caused by passing vehicles was communicated in a slight degree to the articles displayed in his show windows. He turned this fact to account by mounting his diamonds on light coil springs, and the oscillation, transmitted to his windows from the street, caused the stones to sparkle on the quivering wires, greatly increasing the advertising value of the display.

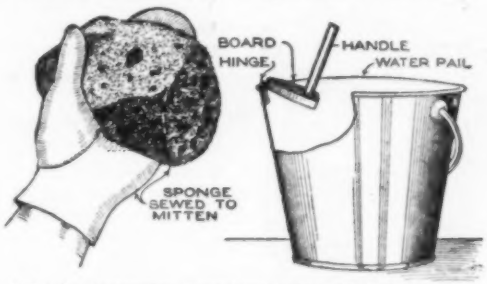


Magnet in Broom Handle Picks Up Tacks

A common bar magnet, placed in a hole bored at the end of a broom handle, makes it possible to pick up pins and tacks while sweeping without bending over. The magnet is either wedged into the hole, or secured in it by means of a bolt running through the handle and bar. The magnet will also be found handy for loosening dirt in corners where the broom does not reach.—Abel Greenstein, New York, N. Y.

A Sponge Mitten and Wringer

A student, who did janitor work while in college, made use of two devices to remove its most unpleasant features.

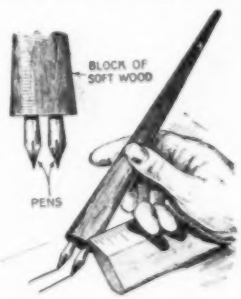


A Little Ingenuity Exercised in Two Helpful Devices Makes Scrubbing a Less Disagreeable Task

Part of his duty was to clean marble, for which he used a damp sponge, but as a result his hands were constantly chapped in cold weather. Accordingly, he sewed a large sponge to the palm of a cheap cotton mitten, which he made waterproof by giving it three coats of rubber cement and letting it dry overnight. His other appliance was a wringer made by attaching a small, flat piece of wood to the rim of a pail by a hinge, and furnishing it with a handle, with which pressure was applied.

A Two-Line Ruling Pen

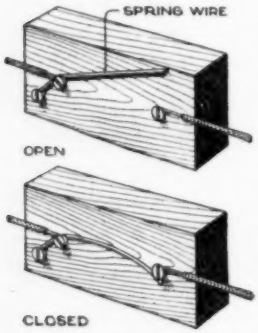
Much time can be saved in ruling lines by using a two-line pen. Drive two old pens into the end of a block of soft wood, spacing them the required distance apart. Then replace them with new pens. The distance between points can be made adjustable by driving in the old pens in a somewhat slanting direction so that the points diverge a little from each other. Pulling out the new pens then spreads their points farther apart, while pushing them in has the opposite effect. The ruler should be tilted at an angle to the paper, so as to make the handle bear on the edge of the ruler.



Kitchen scouring powder thoroughly cleans grease from machine belts and prevents them from slipping.

Simple Switch for Experimenters

An extremely simple electric switch, suitable for temporary use on low voltage, can be made by wrapping a piece of spring wire around two of three wood screws in the manner shown in the sketch. The circuit is kept closed by the pressure of the loose end of the wire against the third screw, and can be opened by dislodging that end from the screw. A makeshift contrivance of this kind can, of course, only be used on a circuit of low-current capacity.—F. H. Rouse, San Francisco, Calif.

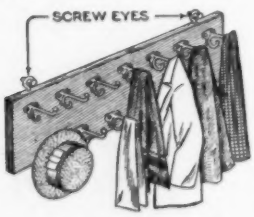


To Keep Shoe Tongue from Slipping

A shoe tongue which does not keep its position causes continual discomfort. Fasten a lacing hook to the top of the tongue, so that the laces passing through adjacent eyelets grip it and keep the tongue from slipping down.

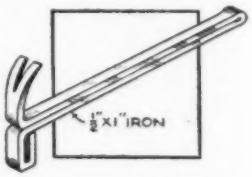
Extra Coat Rack for Parties

The success of a party depends so much upon incidentals that it is worth while to prevent confusion by preparing extra accommodation for coats and wraps. An adjustable hall rack can be made by varnishing one side of a board, 6 by 2 ft. in size, and screwing a double row of hooks into it. Two large screw eyes in its upper edge slip over expansion bolts placed in the wall, and the rack is put into position in one or two minutes. Expansion bolts are convenient for this purpose, whether required by the nature of the wall or not, because, if the spring sockets are left in position after the rack and bolts have been removed, they will serve for all future occasions, and the wall will not be noticeably defaced.—J. Horace Van Nice, Chicago, Illinois.



Hammer Made of Strap Iron

The peculiar claw hammer, shown in the sketch, was made in a few minutes from bar iron, by bending it over and splitting one end to form the claws, as shown. If a heavier head is desired, the other end can be bent over one or two additional times. It is well to round off the handle over almost its full length, while hot, and it improves the job if the two lengths forming the handle are welded together at some point not far from the head. The head and claws may be ground off to give them the correct shape and finish, and a hammer is thus provided which, while somewhat heavy for long-continued use, gives the advantage of great durability.—C. A. Black, Jr., Hightstown, N. J.

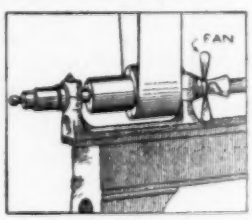


Varnish Brush Keeps Cycle Chain Clean

A bicycle, or motorcycle, chain may be kept clean by clamping a small varnish or paintbrush to the frame of the machine in such a manner that the bristles bear lightly on the upper stretch of the chain. A small clip made of sheet metal, and a 5/16-in. stove bolt, can be used for the clamp, without presenting an unsightly appearance. The brush removes all dust and grit from the chain, thus eliminating one of the most tedious operations incidental to the task of cleaning the machine.

Fan on Lathe Blows Away Chips

A woodworker, who was troubled with the chips from his lathe flying into his face, made use of a fan attached to the live center, as illustrated.

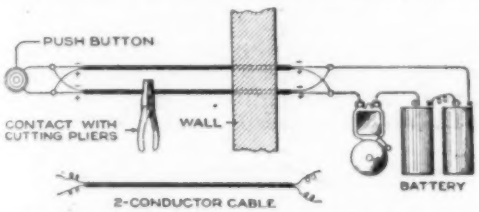


Rubber Corks for Vibration Absorbers

Small motors which are noisy because of vibration, may be silenced by making for them wooden bases, supported on rubber corks. The corks take up the vibration, thus doing away with much of the noise. Of course, this method will not silence the whirr, but it will do much to stop the nerve-racking pounding of some motors.—Chas. Waller, Montreal, Can.

Bell Rung When Wire is Cut

A useful device in electric burglar alarms is the method of electrical connections illustrated. The two cables are laid parallel with each other to carry the alarm or relay current, or the telephone current. The difference is that, with ordinary wiring, when one of the two parallel wires is cut, the circuit is broken; whereas, when



Cutting One of the Two Cables, Instead of Breaking the Circuit, Leaves It Intact and Closes It for an Instant

connected as shown, the cutting of either one of the parallel cables leaves the circuit complete through the two conductors in the other cable, and makes an instantaneous contact between the two wires of the cable which is cut. This contact is the result of the metal of the wire cutter coming in contact with both conductors.

The momentary contact would, of course, not ring the bell very effectively, if connected as shown in the sketch, but would be sufficient to close an alarm circuit through a relay. A wiring system such as this may be used in many different combinations to deceive the burglar into thinking he has eliminated danger, whereas, instead, he has given the alarm. —Joseph Magis, Ouffet, Belgium.

Garter Clasps as Towel Hangers

Sew a discarded garter clasp to the edge of a towel or stove pad. It can then be hung from a nail or hook without any danger of tearing. The broad end of the clasp is the one to be attached to the towel, and the edge of the material should be doubled over before the stitches are made.

Keys Made from Wire Nails

Several workmen in a construction camp kept their tools in the same locker, which made it necessary for them all to have keys. There were not enough to go round, and as the camp was far from any locksmith's shop, the shortage was supplied by makeshift keys made from nails. The blanks were formed by hammering the nails flat from the point to the middle, and turning the shank at a right angle near the head, to make the keys easy to turn. They were then placed one by one in a vise with the model key and filed into shape.—Dale R. Van Horn, Lincoln, Neb.

To Make Fly Paper

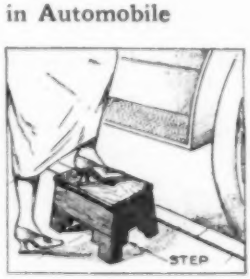
An excellent sticky fly paper can be made of materials that cost very little. Boil linseed oil, to which a small quantity of resin has been added until it forms a stringy paste when cool. Spread this, while hot, upon sheets of heavy paper, with an ordinary paintbrush, and set aside until cool. It is then ready for use in the usual way.—Mrs. O. G. Romig, Denver, Pennsylvania.

Tires for the Carpet Sweeper

Tires for a carpet sweeper may be made by cutting narrow cross sections from an old inner tube. These are cemented to the rubber wheels with thick shellac, and serve the purpose as well as the original tires. Glue will not do for cement, as it will not adhere well to the iron.—H. J. Eberhardt, Detroit, Mich.

Step Carried in Automobile

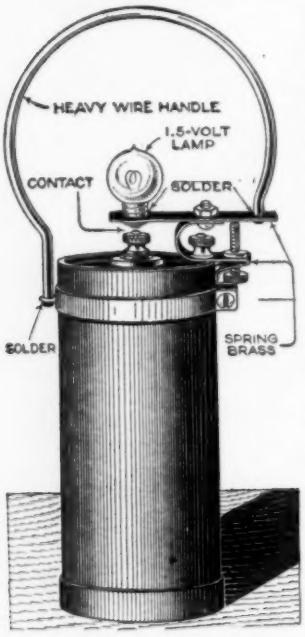
Portable mounting steps for automobiles prevent the inconvenience that frequently occurs at halting places when ladies or invalids are members of a touring party.



¶The rubber cement which can be bought cheaply in large cans for shoe repairing has produced excellent results in mending automobile tires.

Automatic Electric Lantern Lights When Lifted

The feature of the electric lantern shown in the drawing is that it automatically lights when lifted, and goes out when set down, unless the thumbscrew is adjusted to secure steady light in any position. One side of the handle is soldered to a metal clamp, fastened about 1 in. below the top of the battery. The other end is soldered to a strip of sheet brass, ½ in. wide and 2¾ in. long. A 1.5-volt lamp is soldered into a hole at the other end of the brass strip, so that the central contact on the lamp projects ⅛ in. below the strip. A piece of spring brass, ½ in. wide, is bent as shown in the sketch, and screwed under the negative, or zinc, binding post; then fastened to the brass piece which carries the lamp by a small bolt and nut. Another nut is soldered to the top of the spring, to take the thumbscrew shown.



When the lantern is lifted, the strain on the handle pulls against the brass spring and forces the center of the lamp base into contact with the positive, or carbon, pole of the battery, thus lighting the lamp. As long as the lantern is carried or hung up by the handle, it will remain lit, but when put down, the spring forces the lamp out of contact with the positive pole of the battery and the light goes out. The thumbscrew may be tightened to force the lamp into permanent contact. One advantage of the automatic feature is that the lantern is not left burning when not in use, unless the thumbscrew has been tightened.—Geo. Garvin, Elkhart, Ind.

¶ Burned-out incandescent globes make good floats for fishing.

Poorly Placed Lights Cause Loss of Trade

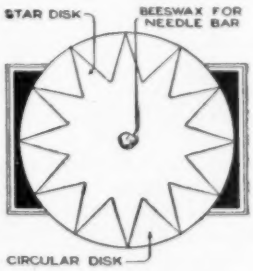
The lights in a confectionery hung from the ceiling above the electric fans, causing a steady flicker on the tables, which was bad on customers' eyes. Steadily the proprietor found his trade going to his competitor, whose lights were placed below the hanging electric fans, giving a steady glow, easy on the eyes. Not until the owner of the first confectionery replaced his lights so as to avoid the flickering effect, did he regain his old customers.—Hilton Butler, Jackson, Miss.

White Paper Makes Keyhole Visible in the Dark

When a door is located in a dark corner the keyhole is hard to find without striking a match, and yet it is not always convenient to keep a light permanently burning. Tack a piece of white paper or cardboard around, or beside, the keyhole, and it can be found without difficulty.—J. H. Moore, Hamilton, Ont., Can.

Phonograph Diaphragms of Paper

The ordinary phonograph is furnished with one reproducer, which the maker intends to play the average record in a satisfactory way. There are many records which this reproducer will not play to suit a critical ear, because it does not bring out the individuality of the record. It is necessary to have several reproducers, in order to play each record to the best advantage.



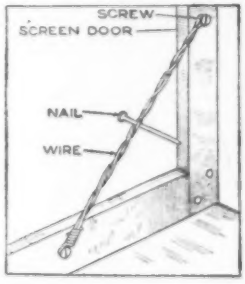
A little experimenting with paper diaphragms will reveal great possibilities. The result will be that band selections in which nothing but the brass instruments are ordinarily heard will be enriched by the tinkle of a flute, or the droning of a saxophone or bassoon. It will often be possible to remove the metallic sound of the records made by stringed instruments.

The process is quite simple. A quantity of high-grade cardboard, such as visiting-card stock, or light-weight Bristol board, will be required. Cut several disks of the cardboard to the same diameter as

that of the diaphragm used in an old reproducer cell, which can easily be obtained. From several of these disks, make star-shaped diaphragms with anywhere from 3 to 36 points. Glue these star-shaped disks to the round disks, varying the combination as much as possible, using different weights of paper and stars with different numbers of points. Give each finished diaphragm a coat of thin shellac and allow it to dry.

To try out each diaphragm, insert it in an empty reproducer cell and fasten the needle holder to the disk by pressing them together with a bit of beeswax between them. Then test the diaphragm by playing different records until it is found what class of record it is best suited to reproduce. Do the same with all of the combinations made. Each diaphragm should be classified, and marked with a number or letter, so that it can be picked out at once. The result of this work, if carefully and patiently done, will be that one can instantly select a reproducer diaphragm suited to the particular record one desires to play.

To Prevent Screen Doors from Sagging



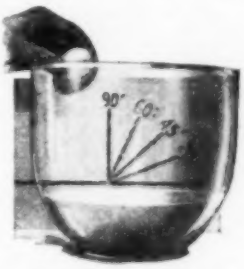
When the bottom rail of a screen door catches on the sill, connect it with the side rail by looping a wire around screws set in both rails, and twisting the wire in the center with a nail.

Water Wings Made from Scraps of Cork

There is little difficulty in making a substitute for the cork belts and inflated bladders which beginners use in learning to swim. Collect a large number of old bottle corks, cut them into small slices, and lay the scraps between two pieces of cloth, 1 yd. square. Stitch the two pieces together, using the needle not only at the edges but all over the surface, so as to keep the scraps of cork evenly distributed. The result will be a square yard of buoyant material, from which sufficient can be cut to make two wings and a connecting strap. It should pass under the arms and across the back and breast, with straps crossing the shoulders.

Testing Eggs in Brine

By observing the buoyancy of an egg in salt water it is possible to determine its age with considerable precision. Dissolve one part of salt in two parts of water, and pour the mixture into a large glass vessel. Place the egg in the water, and if it is not more than 36 hours old it will sink to the bottom and lie horizontally. If it is a few hours older, it will sink just below the surface and remain there, with the thicker end slightly above the horizontal. If it is between four and five days old, the thicker end will rise to an angle of 20° to the horizontal, and this angle increases with the age of the egg. Thus, 45, 60, and 75° indicate an age of 8, 14, and 21 days, respectively; and if the egg takes a vertical position it is at least a month old. The buoyancy at the thicker end is caused by the presence of an air space, which increases with lapse of time as moisture evaporates through the shell.

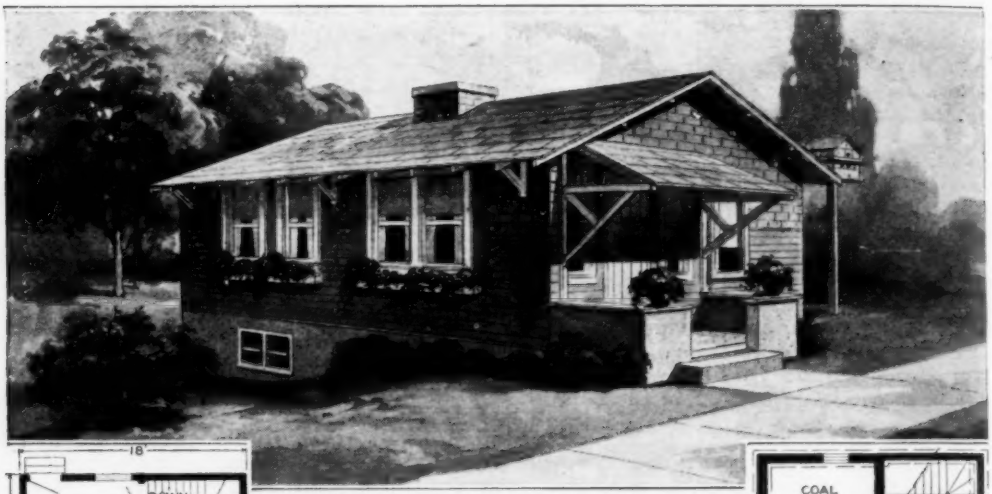


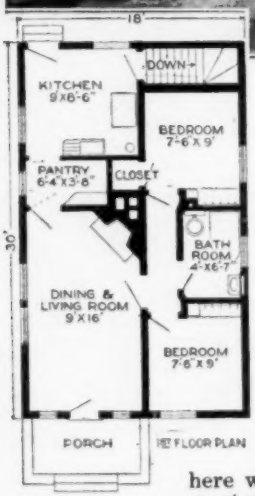
A practical test can therefore be made by graduating a right angle on a large card in the manner shown in the illustration, and leaning it against the glass vessel. The egg is then placed in the brine between the card and the eye of the observer, and the position in which it floats is compared with the lines indicating the different angles.

Clock Hands Made Extra Wide for Clear Vision

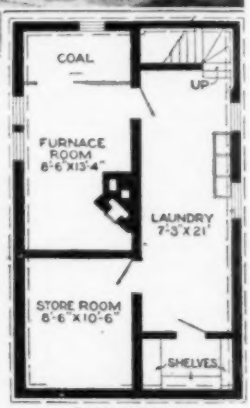
One of the rooms in a factory was so large that employes working at one end of it were unable to see the hands of the clock. The dial was about 10 in. across, and so was clearly visible; but the hands were only ⅛ in. wide, and were therefore exchanged for others, 1 in. in width. While the new hands completely hid the figures, these were, of course, perfectly familiar to everybody.—E. Alpha Dean, Chicago, Ill.

BUNGALOW FOR A SMALL LOT AND A SLIM PURSE





The Little Bungalow Delineated in Perspective Above was Designed for a Small Lot, and Is Only 18 Feet Wide and 30 Feet Long. The Plan at the Left Indicates the Effective Use Made of Every Available Foot of Floor Space, Resulting in a Good-Sized Living-and-Dining Room and Strictly Modern Kitchen and Bathroom. A Large Chimney and Fireplace are Shown. The Basement, Laid Out at the Right, Is Notable for Its Light, Roominess, and the Separation of the Store Room from the Heat of the Furnace Room



DESIGNED BY HERBERT A. SHEARER

WHEN the "own your home" spirit will not be discouraged by a narrow pocketbook, the wide economic range of bungalow design is a most comforting characteristic. Designers have demonstrated time and again that even esthetic satisfaction is not prohibited by small means if the modest dwelling is carefully planned. This is particularly true when land is cheap, but the bungalow described here was designed for a small lot as well as a slim purse, and makes the most of floor space that might easily be constricted to uselessness.

To begin at the bottom, the basement plan took advantage of a rearward slope in the lot to provide good-sized, double-sash windows in the furnace room and laundry, as well as a single sash for the coal bin. A large store room and fruit closet at the front were left dark, and kept cool by isolation from the furnace room. Though the ground plan measures but 30 by 18 ft., the laundry is 21 ft. by 7 ft. 3 in., the furnace room 13 ft. 4 in. by 8 ft. 6 in., and the store room 10 ft. 6 in. by 8 ft. 6 in. The concrete basement wall is 9 in. thick and 8 ft. high, including footings, making the rooms light, airy, and easily kept clean.

The house is built around a big chimney with three flues, one of which serves a large open fireplace in a corner of the living room. This room is 16 ft. long and 9 ft. wide, running lengthwise of the house. Used also as a dining room, a rear door opens through a pantry into the kitchen. In the center of the front wall is the door from the porch, which has concrete rails and a bracket-supported roof. There is a window each side of the door, and two more in the center of the side wall. The bathroom is small, 6 ft. 7 in. by 4 ft., but strictly modern and fitted for hot-water supply. Two bedrooms are 9 ft. by 7 ft. 6 in., and the kitchen is 9 ft. by 8 ft. 6 in., with all conveniences. There is room over the basement stairs for additional closet space. With soft-wood flooring and trim, the cost of this bungalow in village or country should scarcely exceed $1,200; hardwood finish might add $250 to that figure.

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